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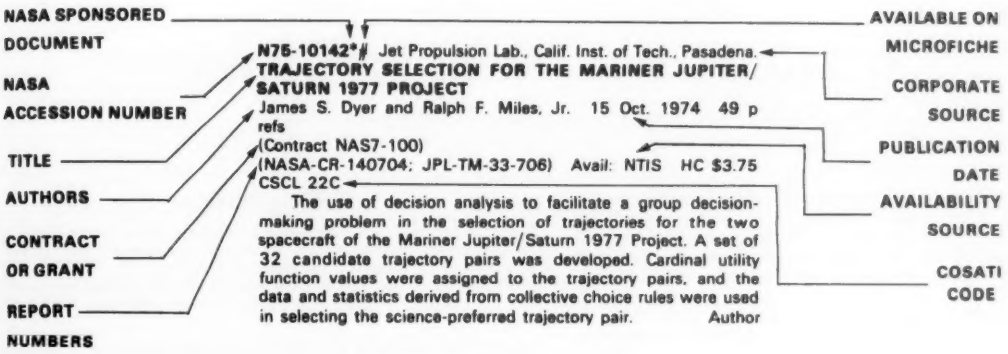
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N75-10142*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRAJECTORY SELECTION FOR THE MARINER JUPITER/ SATURN 1977 PROJECT
James S. Dyer and Ralph F. Miles, Jr. 15 Oct. 1974 49 p refs
(Contract NAS7-100)
(NASA-CR-140704; JPL-TM-33-706) Avail: NTIS HC $3.75
CSCL 22C
The use of decision analysis to facilitate a group decision-making problem in the selection of trajectories for the two spacecraft of the Mariner Jupiter/Saturn 1977 Project. A set of 32 candidate trajectory pairs was developed. Cardinal utility function values were assigned to the trajectory pairs, and the data and statistics derived from collective choice rules were used in selecting the science-preferred trajectory pair. Author

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power: Aircraft Stability and Control; and Research And Support Facilities (air). For Related Information See Also Astronautics.

1.0001, ROUGHNESS EFFECTS ON SUPERSONIC TURBULENT BOUNDARY LAYERS 12398-E

T. UBOTA, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (DAHC04-74-C-0009)

To conduct an experimental investigation at mach 3 and mach 6 of the roughness effects on supersonic turbulent boundary layers. Relevance: This research will contribute directly to the determination of drag for projectiles and missiles under development at BRL, indirectly to the turbulent boundary layer structure problems in Project 'Fumer' at BRL, and will provide research assistance to the MICOM missile research programs on ground to air operations.

Problems to be studied are- (a) the effect of abrupt change in surface roughness, smooth to rough, and rough to smooth, and (b) the effect of roughness height and spacings.

Supporting agency address information: OCRD Army Research Office, Box CM, Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

1.0002, EXPEDITIONARY HANGER

R.H. SEABOLD, U.S. Navy, Civil Engineering Lab., *Port Hueneme, California* 93041

The technical objective is to develop a lightweight expeditionary hanger structure for fixed and rotary wing aircraft at advance bases. The structure shall be configured as an arch and shall be containerized in Type 1-C ISO (International Organization for Standards) containers. Fabric sliding doors shall be provided at each end of the structure. The hanger shall be 76 feet wide and 88 feet long and shall be erectable by six semi-skilled men within 14 hours, and striking effort shall be limited to 80 man-hours. Erection and striking shall require only simple hand tools, manpower, and small hand operated winches.

The Air Force Civil Engineering Center will use the LOCARCH concept to prepare statement of work for a contract for design, fabrication of a prototype, production-type tests and test report. The remainder of the work will be accomplished by Air Force contracting.

Supporting agency address information: Naval Facilities Engineering Command (031A), Alexandria, Virginia 22332

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0003, STUDY OF WALL JETS IN DIFFUSERS

W.J. MAEGLEY, Martin Marietta Corporation, *Denver, Colorado* 80201 (F33615-74-C-1117)

AF function - development of high performance thrust augmenting ejectors for VSTOL aircraft. Deficiency - a knowledge of the optimum mass flow required to prevent diffuser stall. Research - compare diffuser performance for a variety of boundary layer nozzles and jet velocities to identify the optimum combination. How research contributes - will furnish the data necessary to maximize ejector performance.

The ability of wall jets to prevent flow separation in a diffuser will be experimentally examined. Measurements of the static pressure and velocity profiles in the diffuser will be made. By systematically varying the diffuser angle and the strength of the wall jets, the criteria for the prevention of separation will be determined.

Supporting agency address information: Aerospace Research Laboratory LE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0004, DEVELOPMENT OF SINGLE POINT RELEASE SYSTEM FOR THE MA-2 HARNESS

R. FROST, Frost Engin. Development Corp., *Englewood, Colorado* 80110 (N62269-73-C-0970)

The objective is to develop a manual single point release system to provide the crewmember with an increased capability for accomplishing an emergency egress from an aircraft on land, water and underwater, and for divesting equipment such as the parachute after an ejection. This contract supports Work Unit DK 801, Agency Accession No. 833218.

A prototype single point release system will be built to function in accordance with requirements established by NAVAIRDEVCEN, to assure improved egress from all modes of emergency escape. The prototype system will be tested for their performance under all emergency escape situations in accordance with a specific test plan previously developed. Crash testing will also be conducted to insure structural integrity and reliability. Size and weight will be critically considered. Human factors engineering standards will also be applied.

Supporting agency address information: Naval Air Development Center, Crew Systems Department (401102), Warminster, Pa. 18974

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0005, C-130 WELDBOND FUSELAGE PANEL FLIGHT EVALUATION

J.A. KITZER, Lockheed Georgia Company, *Marietta, Georgia* 30060 (F33615-75-C-3010)

In-service demonstration and evaluation of structural hardware based on the development and application of new structures and manufacturing technology help provide the necessary confidence required for the adoption of such technology in the design and production of future aerospace systems. The objective of this effort is to conduct an in-service inspection and monitoring program to evaluate the performance of a weldbonded forward fuselage side panel installed on a C-130H aircraft. The weldbonded joining concept promises a 20-30 percent cost savings and increased structural efficiency in the development and production of future aircraft.

Visual, radiographic, and ultrasonic inspections will be conducted periodically to assess the condition of the installed weldbonded fuselage panel and evaluate this construction concept over an extended time period under service conditions. If no problems are encountered, the panel will most likely remain on the aircraft.

Supporting agency address information: AF Flight Dynamics Laboratory FBS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0006, INVESTIGATION OF INTERACTION OF TURBINE BLADE TIPS AND LABYRINTH SEALS WITH HOUSINGS OF JET ENGINES AND GAS TURBINES
R.A. BURTON, Northwestern University, School of Technology, *Evanston, Illinois* 60201 (NSG 3039)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0007, DEDICATED VTOL MICROWAVE SYSTEM
UNKNOWN, Westinghouse Electric Corp., *Baltimore, Maryland* 21227 (N00019-75-C-0147)

Study and determine design parameters for the development of a multi-mission optimum avionics system for helicopters.

Conduct exploratory analysis to: (a) Determine requirements for VTOL mission avionics. (b) Determine and categorize blade designs. (c) Explore feasibility of utilizing typical blade cross section. (d) Assess feasibility of implementing system solution. (e) Select most promising approach. (f) Identify risk. (g) Analyze cost and benefit.

Supporting agency address information: Naval Air Systems Command, Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0008, PROGRAM TO MODIFY SIMULATION OF AIRCRAFT ENCOUNTER WITH TRAILING VORTICES
UNKNOWN, Mass. Inst. of Technology, Graduate School, *Cambridge, Massachusetts* 02139 (055775 (TRAIS NO.))

The objective of this contract is to modify the wake vortex encounter simulation program developed under Contract DOT-TSC-166. These modifications are intended to allow the addition of smaller aircraft such as the Lear Jet and the PA-30 to the list of encountering aircraft.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0009, NAVY ENVIRONMENT - BALLOON VERTICAL MOTION
J. NELSON, Winzen Research Incorporated, *South St. Paul, Minnesota* 55075 (N00014-75-C-0072)

High altitude balloon research to obtain a better understanding of the earth-space coupling as related to scientific and operational problems requires controlled flight through balloon ascent, float and descent evolutions. Precise vertical motion control of large balloons is essential to scientific data gathering missions at high altitude. Helium flow rate and ballast drop are means by which vertical balloon motions may be controlled by a flight operations crew.

This effort expands the previously developed 'riserate' model which computes aerodynamic and thermodynamic constants from inputs of time, temperature, pressure altitude and gross airborne balloon system weight. The constants will be used in the ascent and float period of flight, and provide more precise valving times for effective ascent, descent and float altitude control.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0010, CYCLOGYRO WING SYSTEMS FOR ENERGY EXTRACTION
R. COENE, Technische Hogesch. Te Delft, *Delft, Netherlands*

Aerodynamic calculations indicate that a nearly two-dimensional cyclogyro wing system with its axis parallel to the ground and perpendicular to an oncoming wind can be used for the extraction of wind energy. In a proper design the ground effect increases the mass flow and thereby the amount of energy that can be extracted for a given frontal area at a certain height. On the scale of the span of the system, it acts as a pair of vortex-generators and one may expect that in a ground surface distribution of large systems, the spacing can be relatively close.

The investigation is focused on the aerodynamic aspects, theroretically as well as experimentally, but structural aspects and aero-elastic effects are not ignored.

SUPPORTED BY Delft Technical University - Netherlands

1.0011, INVESTIGATION OF ROTATING STALL PHENOMENA IN AXIAL FLOW COMPRESSORS
G. LUDWIG, Calspan Corporation, *Buffalo, New York* 14221 (F33615-73-C-2046)

Develop a three dimensional time variant stall and separation theory for turbine engine axial flow compressors and define a control mode that will utilize available aerodynamic parameters to achieve stable operation under all flight conditions.

This continuing effort has progressed through stationary three dimensional cascade testing. Rotating cascade testing control circuit testing and engine testing will be accomplished in future programs.

Supporting agency address information: AF Aero-Propulsion Laboratory TBC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0012, J85-21 COMPRESSOR BLADING AEROMECHANICAL ANALYSIS
L. KING, General Electric Company, *Cincinnati, Ohio* 45215 (F33615-74-C-2067)

The objective of this program is to conduct a detailed analysis of the large volume of aeromechanical and aerodynamic test data obtained from the J85-21 during the 1972-73 development program, and is to be directed toward quantifying instability parameter relationships. The final results should provide for a better understanding of the mechanism of blade flutter in turbine engine compressors and an insight into the parametric relationships affecting blade instability.

The program shall basically consist of the correlation of data toward obtaining quantitative relationships among the prime parameters which govern the stability of blades, particularly in the negative incidence regime. Such relationships shall express instability boundaries as a function of interactive parameters, such as relative velocity, relative mach number, incidence angle, reduced velocity parameter, choke, or minimum loss conditions, together with appropriate blade dynamics parameters, e.g., twist-bend coupling. Aerodynamic variables shall be defined at specific spanwise locations on the airfoil (with pitchline analysis as a base and extrapolated analytically from available radial traverse data). Multiple-variable stability boundaries shall be determined for those modes of instability observed in the J85- 21 compressor development program.

Supporting agency address information: AF Aero-Propulsion Laboratory TBC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0013, VALIDATION OF TRANSPORT AIRCRAFT VIBRATION PREDICTION METHODS
J.E. MARSH, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

To substantiate the vibration prediction method developed by Lockheed-Georgia for aircraft structures that are substantially different from conventional transport aircraft structures. Substantiation will be based on the accuracy of comparisons between vibration predictions and response measurements made in the AFFDL acoustic facility.

An integrally stiffened I-1011, 6' x 4' panel will be instrumented with linear accelerometers and microphones and exposed to several broad- band (50-2500 Hz), random, fluctuating pressure environments. Excitation and response measurements will be obtained, transformed to the frequency domain, and statistically correlated. Regression analysis will be conducted to functionally relate structural response to environmental excitation. This relationship will be compared to the predicted relationship developed by Lockheed-Georgia.

Supporting agency address information: AF Flight Dynamics Laboratory FYS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0014, CONTROL INDUCED AEROELASTIC INSTABILITIES
T.E. NOLL, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

Aircraft with active control systems can encounter instabilities which result from the interaction of the control system with the aeroelastic response if adequate control compensation is not provided. The objective of this effort is to substantiate analyses which account for the control system interaction. This effort will establish the confidence and reliability of AFFDL in-house analysis procedures. The ultimate payoff will be a reliable method for use in the design stage for predicting and preventing control induced aeroelastic instabilities thus reducing cost and increasing flight safety for a new aircraft.

Frequency and time domain computer programs developed under AFFDL contract F33615-73-C-3063 will be applied to an advanced fighter aircraft with an active control system to predict control induced aeroelastic instabilities. These analyses will involve the interaction of the structural response, the airloads, and the control system response. A final technical report will be prepared.

Supporting agency address information: AF Flight Dynamics Laboratory FYS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0015, CONTROL OF OXIDES OF NITROGEN FROM THE DISCHARGE OF ELECTRIC ARC HEATED AERODYNAMIC TEST FACILITIES

P.R. PITTS, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

To identify and alleviate technological deficiencies, high speed flight vehicles must be tested under the conditions encountered during re-entry into the earth's atmosphere. Heating studies and tests, which can reduce acquisition costs, are conducted for SAMSO and others on aerothermal structures and protection systems in ground test facilities such as the AFFDL HTF, EGF and 50 megawatt facilities at lower production and operating cost than by extensive operational testing. In these simulation facilities, as in free flight, the air about the model is dissociated and oxides of nitrogen (NOx) are formed. The facility effluent is exhausted to the atmosphere where the NOx contributes to the local air pollution. The objective of this work unit is to develop the technology, techniques and hardware to treat the noxious components and render the facility effluent innocuous, and to refine the instrumentation and techniques used to measure and control the NOx effluents. Control of NOx makes possible the continued use of the simulation facilities in overcoming the technological deficiencies of the high speed flight vehicles.

The efficiency of the existing, in-house developed, absorption scrubbing technique will be evaluated. Analysis and extensive realistic operational testing will be conducted to demonstrate the practicability of new technologies to contribute to operating cost reduction and scrubber performance improvement. Apparatus will be developed to insure the reliability of existing instrumentation. Instrumentation will be developed to verify stack discharge emission limit compliance when said limits are established by others.

Supporting agency address information: AF Flight Dynamics Laboratory FXN, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0016, HYPERSONIC, HIGH REYNOLDS NUMBER PROJECTILE AERODYNAMICS

L. PALACIO, Space Research Corporation, *North Troy, Vermont* 05859 (DAAD05-75-C-0726)

Obtain quantitative experimental pressure and temperature distribution data on 15 degrees half-angle cones via telemeter utilizing 16' gun launch at hypersonic, high Reynolds Number condition.

Piezoelectric transducers and thermisters will be used as an input to an FM/FM crystal controlled transmitter for pressure and temperature sensing respectively. This information is telemetered to ground and recorded on tape. The 16' harp gun is to be used as a launcher for the cones for mach numbers 6, 7, 8, 9, 10 inclusive.

Supporting agency address information: AMC Exterior Ballistics Laboratory, US Army Ballistic Research Laboratories, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

1.0017, EXPERIMENTAL INVESTIGATION OF UNSTEADY SEPARATION 12680-E

D.P. TELIONIS, Virginia Polytechnic Institute, School of Engineering, *Blacksburg, Virginia* 24061 (DAHC04-75-G-0067)

To investigate experimentally the flow properties in the neighborhood of separation within an unsteady boundary layer in an effort to verify the Sears-Telionis concept of unsteady separation. Relevance: The dynamic stall problem which occurs on the retreating blade of an advancing helicopter rotor can be explained in terms of an unsteady turbulent boundary layer separation. The description of this physical process is based on the Sears-Telionis unsteady separation concept. This concept is fundamental to all dynamic stall research work being carried out at AMRDL-AMES Directorate.

A glycerin-water mixture will be used to yield low Reynolds Numbers and thick boundary layers with reasonable velocities. Separation will be induced by time-dependent adverse pressure gradients. Hydrogen bubbles and ink dyes will be used for flow visualization.

Supporting agency address information: AMC Army Rsch. Office, (ARO- D), Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

1.0018, HT AM 75-4- ANALYSIS AND CORRELATION OF SIKORSKY IMPROVED ROTOR BLADE WIND TUNNEL DATA

E.E. AUSTIN, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604

To assess performance and loads advantages of the Sikorsky improved rotor blade and to determine the ability of the rotorcraft flight simulation to predict these characteristics for an advanced technology blade.

Performance and loads data from the model rotor test of the Sikorsky Improved Rotor Blade (IRB) will be compared with similar data obtained from more conventional rotor designs. Advantages and disadvantages of the IRB will be assessed. A correlation of the rotorcraft flight simulation (C-81) with the IRB data will also be performed.

Supporting agency address information: AVSCOM Air Mobility R & D Lab, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0019, HT AM 75-5- ANALYSIS OF ROTOR PERFORMANCE DEGRADATION DUE TO MANUFACTURING TOLERANCES

F.A. RAITCH, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604

To investigate helicopter rotor blade airfoil profile imperfections due to typical manufacturing tolerances, and the effects of these imperfections on rotor aerodynamic performance, especially when using an advanced sophisticated airfoil.

Seven different airfoils will be analyzed using either the NASA/Lockheed/NC State Univ. program or the Boeing VERTOL TEA 267 Program, to yield 2D lift, drag and pitching moment, in both clean, ideal profiles and with selected profile imperfections imposed, reflecting conventional manufacturing tolerances.

Supporting agency address information: AVSCOM Air Mobility R & D Lab, Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, HIGH SPEED REACTING AND RADIATING FLOWS

J.R. BARON, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (F44620-75-C-0040)

The AF requires improved heat protection technology for hypersonic vehicles reentering the atmosphere to prevent erratic aerodynamic effects caused by ablation of heat shield materials. This research addresses two aspects of this need - the design of optimum shapes for minimizing radiative heat input from shock layers, and the detailed understanding of the microscopic physical and chemical phenomena occurring at a solid surface which is reacting with a high speed air flow. The radiative heating aspect of the work entails the application of a modificiation of the differential approximation method of predicting radiative environments in gases. The modification consists of replacing the usual isotropic (spherical) assumption for the radiative energy flux by an ellipsoidal distribution which permits all degrees of non-isotropy between the sperical and the opposite extreme of unidirectional beam. This work is nearing completion. The molecular beam experiments will seek to learn more details of some hysteresis like-effects discovered in previous experiments measuring reaction rates for oxygen beams impinging on graphite surfaces. These rates exhibited strong dependence on previous history of the surface temperature and beam properties.

SUPPORTED BY U.S. Dept. of Defense - Air Force

2.0002, REEFING SLEEVE DESIGN
J. NELSON, Winzen Research Incorporated, *South St. Paul, Minnesota* 55075 (F19628-75-C-0111)

AF function - advanced balloon systems (surveillance, delivery operations, environmental research support, space equipment test). Deficiency - launching methods for single cell balloons to carry payloads of 10,000 pounds or more do not exist and recovery systems for this payload weight class are complicated and inefficient. Objective - develop a reefing sleeve for a single cell balloon non-dynamic launch method. How research contributes - this development will obviate the need to develop advanced balloon platform launchers, eliminate dynamic launch forces on single cell balloons, thereby increasing their capabilities, and provide lower cost, more efficient payload recovery systems. One balloon will be fabricated and two balloons will be modified to include cloth reefing sleeves designed to prevent 'sailing' by constraining the undeployed balloon material until required to accommodate additional inflatant.

Supporting agency address information: AF Cambridge Research Laboratories LC, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, T-BURNER VENT FLOW STUDY AND STATISTICAL ANALYSIS OF STEADY STATE COMBUSTION OF NONMETALLIZED COMPOSITE SOLID PROPELLANTS
R.L. GLICK, Thiokol Chemical Corporation, *Huntsville, Alabama* (F44620-74-C-0080)

This research supports RO 5.1 in the examination of stable solid propellant combustion. This work is needed for accurate design of future systems and the avoidance of major costly problems during motor development. A recent significant advancement in the analysis of composite propellant combustion has been to model the macro-burning surface as an ensemble of independent, quasi-one-dimensional flames and analyze this model with statistical methods. This approach treats the heterogeneities realistically and applies to both steady and non-steady combustion regimes. Glick has derived a statistical steady-state burning rate expression and determined distribution functions for propellant with polydisperse spherical oxidizer when the burning surface has the topography of Beckstead, Derr, and Price (BDP). Burning rate predictions with this approach require a unit combustion model for a fuel/oxidizer surface pair. Proposed research will adapt the BDP model as modified by Sammons to Glick's statistical model so that propellants with mixed, polydisperse oxidizers can be treated. In addition, distribution functions for mono- and polydispersions of spheres will be determined experimentally and compared with theoretical values. Finally, distribution functions will be determined for polydispersions of spheroids. The latter will permit theoretical investigations of oxidizer shape effects.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0002, UNIFIED IGNITION MODEL
H. BRADLEY, U.S. Navy, Weapons Center, *Ridgecrest, California* 93555

To develop a unified ignition model for propellants.

The interim mathematical formulation will include the addition to conduction, surface regression, subsurface reactions, and in-depth absorption of radiation. The surface reaction layer formulation will include surface decomposition expressed in terms of three chemical processes, successive surface decomposition events (i.e., gasification prior to flame development, formation of decomposition products on the surface, pyrolysis after flame formation), and heating by conduction from the adjacent gas phase, and by radiation and convection from external sources. The gas phase and flame zone formulation will account for two reaction pathways, conduction normal to the surface, convection normal to the surface, and diffusion between reactants and products. After success has been achieved with this formulation, additional features which account for more details of chemical processes will be incorporated into the model.

Supporting agency address information: AMC Ballistic Research Lab, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0003, DESIGN AND FABRICATE WOVEN STRUCTURAL SURFACING MATERIAL
D. BECKLEY, U.S. Polymeric Chemical Inc., *Santa Ana, California* 92707 (N68305-74-C-0003)

The work shall confirm whether or not that a woven, double fluted truss core with proper rigidization and surfacing materials is capable of withstanding design stresses associated with its use a core material in a fiberglass/truss core sandwich material to be used as an expedient airfield surfacing.

Sufficient prototype truss core material shall be produced and tested in laboratory conditions to permit a decision regarding continued development of field erection concepts, connections, and skid resistant surfaces.

Supporting agency address information: Civil Engineering Laboratory, Naval Construction Batt. Ctr. (153), Port Hueneme, California 93043

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0004, RELAXATION EFFECTS IN FATIGUE CRACK GROWTH IN ALUMINUM ALLOYS
H.L. MARCUS, Rockwell International Corp., *Thousand Oaks, California* 91360 (F44620-75-C-0018)

The longevity, reliability and life-cycle costs of aerospace structures are related to the fatigue properties of the structural materials used. In fact, the fatigue properties of structural materials often limit their application, as well as the performance of the system in which they are incorporated. Thus, it is important to understand the mechanism of fatigue. One of the areas in fatigue crack propagation that has not been investigated in any depth is the influence long hold times under stress have on subsequent fatigue crack growth. This information on the relaxation behavior at the crack tip is vital since the general testing techniques in evaluating materials and structures use accelerated time schedules and are not representative of normal operation of a system. The objective of this research is to establish how crack tip relaxation effects, resulting from long hold times, will influence subsequent fatigue crack propagation in aluminum alloys. The relaxation studies will be performed on 2000 and 7000 series aluminum alloy samples to which simulated cyclic stress-strain damage has been done, and the data correlated with direct measurements at the crack tip of compact tension and center-crack specimens. The influence of a variety of loading conditions and

changes in microstructures will be studied to establish the important metallurgical variables involved.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0005, REFLECTANCE SPECTROSCOPY AND AUGER SPECTROSCOPY OF METALS AND ALLOYS
J.R. STEVENSON, Georgia Inst. of Technology, School of Physics, *Atlanta, Georgia* 30332 (AF-AFOSR-2773-75)

The Air Force is vitally interested in reducing costs and increasing reliability of mechanical and electronic systems exposed to the hostile environment of the atmosphere. Oxidation and corrosion of metals and alloys continues to be a major factor in operating and maintaining (O & M) aircraft systems. Of all of the recent techniques to examine surfaces of solids, the use of synchrotron radiation spectroscopy provides the most sensitive and specific information about the atoms/ions and electrons on solid surfaces. This research will utilize an electron storage ring as a source of polarized electromagnetic radiation in the UV to IR region to study the surface stability of aerospace metals. Auger spectroscopy will be used to monitor the chemical characteristics of the surface. Controlled atmospheres of oxygen and nitrogen will be used to produce well defined changes in surface characteristics. The effects of these changes on the optical constants, Auger spectrum, and secondary electron emission ratio will be determined. An analysis of the experimental results will provide information on the electronic surface states and their influence on chemisorption and chemical stability of aircraft metals.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0006, DELAYED LIGHT EMISSION OF THE PRODUCTS OF OZONATED RUBRENE
R.R. RICHARDS, Greenville College, Undergraduate School, *Greenville, Illinois* 62246 (NSG 1097)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0007, AN IMPACT IGNITION MODEL FOR SOLID PROPELLANTS
H. KRIER, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (DAAD05-73-C-0070)

To develop a generalized impact ignition model based on a one- dimensional solid phase heat balance including chemical heat generation and convective heat transfer.

An impact ignition model will be developed since current ignition models are unsatisfactory for vulnerability. This model will allow predictions of ignition probability due to projectile and fragment impact, time to ignition after impact, and temperature profiles and distribution in the propellant after impact. The effect of compressional and rarefaction waves from the impacting projectile and the propellant free surface will also be investigated.

Supporting agency address information: AMC Ballistic Research Labs, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0008, PROPELLANT BURNING RATE MEASUREMENTS IN HIGH GAS FLOW ENVIRONMENT
J.C. OHARA, Tulane University of Louisiana, School of Engineering, *New Orleans, Louisiana* 70118 (DAAD05-74-C-0764)

Measure linear burning rate of fast burning composite propellants under high gas flow conditions.

With breakwires measure burning rate of a test section of propellant constant gas flow conditions. Use a moveable wall with area expansion to maintain constant mach number over the test section.

Supporting agency address information: AMC Ballistic Research Laboratories, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0009, GAS FLOW AND PRESSURE ANOMALIES IN POROUS PROPELLANT BEDS
N.J. GERRY, U.S. Army, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005

(1) To obtain simultaneous data on charge motion, pressure front travel and flame front travel and (2) to develop a more general model on gas flow and spreading in a bed of propellant.

Location of the pressure front in a bed of propellant will be detected using multiple pressure gages. Attempts to record the flame front position will involve, first, ionization probes and latter, if necessary, microwaves and/or resistance wires. Attempts to record motion and compaction of the propellant bed will consist of high speed cinematography and laser illumination.

Supporting agency address information: AMC Ballistic Research Labs, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0010, MECHANISTIC MODELLING OF SOLID PROPELLANT COMBUSTION
M. IBIRICU, U.S. Army, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005

This investigation examines the effect of thermal influences on the steady burning rate of solid propellants.

Thermal stimulation is one of the few techniques to test and expand solid propellant combustion models. Increasingly more complex features will be incorporated into the model already formulated in order to determine the effect of the participation of the active condensed phase layer, high levels of stimulus and high combustion pressures. Homogeneous propellants will be studied first and composites later.

Supporting agency address information: AMC Ballistic Research Labs, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0011, PYROLYTIC FRAGMENTATION STUDIES OF COMPOSITE NITRAMINE PROPELLANTS
A. JUHASZ, U.S. Army, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005

To provide detailed analytical information on the pyrolysis products of propellants.

Small samples of propellants and propellant ingredients are pyrolyzed under controlled conditions (temperature, pressure, and heating profile) and the pyrolysis products identified using gas chromatography and mass spectroscopy.

Supporting agency address information: AMC Ballistic Research Labs, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0012, IGNITION AND FLAME MODELING
D. KOOKER, U.S. Army, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005

In current interior ballistics models, predictions of flame spreading through packed beds of propellant rely heavily on an over- simplified view of local ignition. Except for those models which assume instantaneous uniform ignition of the bed, local ignition is assumed to occur when the temperature of the propellant exceeds a specified value. Considering the complexities of the physical process and the consequences of an ignition malfunction, this very simple description may be entirely inadequate for interior ballistics models required to make 'prior' predictions. The present modeling task takes the fundamental view that ignition and combustion are not separate entities, i.e., there is no one temperature at which a hot particle suddenly bursts into steady state combustion.

Predictions of the local ignition event will be made from a mathematical model which couples the time-dependent energy transfer in the solid with the unsteady gas dynamics of the flame region and will retain the effects of viscosity, heat conduction, diffusion, finite-rate chemistry, and non-uniform pressure to allow assessment of these influences as combustion is established.

Supporting agency address information: AMC Ballistic Research Labs, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0013, EROSIVE BURNING
C.W. NELSON, U.S. Army, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005

Develop an experimental device which will measure erosive propellant burning with as many constant flow properties as can be attained.

Search the existing literature for a state-of-the-art assessment. Evaluate proposed schemes of other agencies. Select one or two promising approaches and conduct appropriate experiments with propellants whose burning properties are fairly well known. Select for continued development that scheme which seems most promising.

Supporting agency address information: AMC Ballistic Research Laboratories, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0014, COMBUSTION PROPERTIES OF FUEL RICH PRESSED PROPELLANTS
J.R. WARD, U.S. Army, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005

Establish a technology base for use of fuel rich pressed propellants in air-augmented rockets.

Propellants will be formulated containing as the fuel rich component magenesium or zirconium metal. The inorganic oxidizers which will be used with each fuel will be sodium, potassium, and lead nitrate- lead, strontium, and barium peroxide- potassium perchlorate- and polytetrafluoroethylene. Calculations will be made to determine the heating values, flame temperature, and product distributions of each propellant formulations which appear to be the most promising as gas generator propellants will be subjected to the experimental measurements described in the next paragraph. The following measurements will be performed- (a) burning rate as a function of pressure (from 15 to 1000 psi), percent fuel content, fuel particle size, and consolidation pressure- (b) residue analysis- and (c) temperature sensitivity to burning rate.

Supporting agency address information: AMC Ballistic Research Laboratories, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0015, INVESTIGATION OF OH REACTIONS OF IMPORTANCE IN THE PERTURBED TROPOSPHERE
D.D. DAVIS, Univ. of Maryland, School of Arts, *College Park, Maryland* 20740 (72P22042)

The specific objectives of this project will be to provide absolute rate constants and primary product yields for the gas kinetic processes (1) through (12). (1) OH plus SO2 plus M yields HSO3 plus M, (2) HSO3 plus HSO3 yields H2SO3 plus SO3, (3) SO3 plus H2O yields H2SO4, (4) OH plus C2H4 yields products, (5) OH plus C2H4 yields products, (6) OH plus C3H6 yields products, (7) OH plus 1-butene yields products, (8) OH plus benzene yields products, (9) ON plus toluene yields products, (10) OH plus ethyl benzene yields products, (11) OH plus o-xylene yields products, (12) OH plus m-xylene yields products. The above processes are of considerable importance with regards to defining the correct mechanistic scheme for the oxidation of SO2 to H2SO4 aerosol and for the formation of photochemical smog. The kinetic information to be provided should become, therefore, an important part of a large data base for defining new control strategies and new air quality standards for the urban areas of this country. The approach to be followed in this study will involve the use of two relatively new kinetic techniques: 1) Flash photolysis-resonance fluorescence. 2) Laser flash photolysis-TOF mass spectrometry. The first method will be used primarily to determine absolute rate constants, the second technique for defining primary product yields for reactions (1)-(12).

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

3.0016, PNEUMATIC PROCESSING OF HIGH BURNING RATE PROPELLANTS
A.J. COLLI, U.S. Navy, Ordnance Station, *Indian Head, Maryland* 20640

To apply the pneumatic process to the manufacture of fast burning rate propellants by grinding the ingredients in process.

The efficiency of grinding ammonium perchlorate by means of an advanced 'jet' mill, will be investigated. Samples of the ground oxidizer will be collected and evaluated. Methodology will be developed to allow continuous grinding and mixing of ingredients.

Supporting agency address information: Naval Sea Systems Command, Washington, D. C. 20362

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0017, A STUDY FOR PREDICTING RESIDUAL STRENGTH OF BATTLE-DAMAGED STIFFENED AND UNSTIFFENED TUBES
C. LAKSHMIKANTHAM, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172

The objective of this proposal is to analytically predict the residual strength of battle-damaged stiffened and unstiffened isotropic/composite torque tubes and curved panels. The relevance of the proposed study is evident from the fact that metallic and composite material torque tubes are used as drive shafts in helicopters. Stiffened curved panels are also a common feature of helicopters. Experimental work based on in-house programs has shown the pre-damaged and undamaged metallic tubes exhibit consistent buckling and post-buckling patterns which can be modelled as simple geometrical shapes as parallelograms. From these models it is possible to deduce approximate analytical formulas for predicting the residual strength of such damaged tubes. It is the purpose of this study to deduce such formulas for unstiffened damaged isotropic tubes and possibly extend them to stiffened composite tubes with damage. It is also proposed that similar predictive models may be deduced for the residual strength of stiffened curved panel structures where a part of the structure is damaged.

The approach will be analytical/numerical and will concentrate on approximate predictive formulas for residual strength.

Supporting agency address information: AMC Materials and Mechanics Res. Ctr., Attn- AMXMR-X, Watertown, Mass. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0018, FRACTURE AND FRACTURE TOLERANCE OF BRITTLE POLYMERS AND THEIR COMPOSITES
E.M. WU, Washington University, School of Engineering, *St. Louis, Missouri* 63130 (AF-AFOSR-2687-74)

Air Force flight vehicles must achieve additional design integrity and reduced life cycle costs to meet overall system requirements. In addition, composite materials hold significant potential for increased vehicle performance enhancements. The fracture properties of this material must be known and characterized to provide reliability design data and data to define rational inspection intervals and procedures. This research project contains both theoretical and experimental tasks. Theoretical tasks include the study of the mechanics of crack arrest when arrestment strips have been included in the parent material, and the analytical characterization of cracks at different growth stages. Experimental verification tests will be conducted to correlate with the theoretical efforts. Unidirectional loading of inclined cracks will initially be used for these experiments. In addition, a pilot test apparatus will be developed to biaxially load composite plate specimens.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0019, PLUME DYNAMICS OF SMOKELESS SOLID PROPELLANTS 12059-RTL
E. MILLER, Univ. of Nevada, Graduate School, *Reno, Nevada* 89507 (DAHC04-74-G-0054)

To determine a method for either inhibiting the development of the secondary smoke plume from rocket and guided missile systems or dispersing it rapidly once it is formed. Results from this research will be useful in support of an Army smoke measurement program now under way, and should contribute to the formulation of smokeless propellants for future Army use.

(1) All relevant literature on aerosols, cloud physics, rocket plumes and propellant smoke will be reviewed and evaluated. (2) an improved mathematical model of droplet growth in the rocket plume will be developed or adapted from existent programs. (3) computer calculations will be made with developed models using data from calculations and tests of candidate smokeless propellants at MICOM, Navy, Air Force, and contractor facilities.

Supporting agency address information: OCRD Army Research Office, Box CM, Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

3.0020, WATER DIMER INVESTIGATION

J.S. MUENTER, Univ. of Rochester, School of Arts, *Rochester, New York* 14627 (F19628-75-C-0063)

AF function - defense meteorological satellite. Deficiency - presently the effect of the water dimer for atmospheric probing in the infrared and microwave is unknown. Objective - using supersonic nozzle techniques for the formation of the water dimer, microwave, beam and stark effect measurement will be utilized to obtain the structure of the molecule. The thermodynamic properties of this molecule will be studied and as much information as possible on the effect of the dimer on atmospheric radiation will be inferred. How research contributes - the results of this research will determine the basic molecular structure of the molecule which is not presently known. It will provide direct results on many of the microwave transitions of the molecule and on the dipole moment of the molecule which quantity is necessary to calculate the transition intensities in the far infrared. The approximate frequency of the vibrational frequencies in the infrared will be inferred as well as the rotational spacing in these bands and their approximate intensity.

Supporting agency address information: AF Cambridge Research Laboratories OP, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0021, RADOME AND LEADING EDGE RAIN EROSION PROTECTION SYSTEM

D. FRANK, B.F. Goodrich Company, *Akron, Ohio* 44311 (N00019-73-C-0275)

Evaluate erosion resistant elastomeric compounds to determine best material(s) or combination of materials to protect the radomes and minimize rain erosion of leading edges on military aircraft.

EPR, EPDM and neoprene compounds are being compounded, cured, and tested at 500 mph in 1 inch per hour simulated rain.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0022, LABORATORY PROGRAM OF QUANTITATIVE MEASUREMENTS IN SELECTED BANDS OF NO2, NO, HNO3, AND H20

UNKNOWN, Ohio State University, Graduate School, *Columbus, Ohio* 43210 (055814 (TRAIS NO.))

The contractor shall peform the following tasks: Task 1 - Conduct laboratory program to make quantitative measurements of intensities and spectral line positions for selected infrared bands of NO2, NO, HNO3, and H2O. Task 2 - Review and process measurements of NO2 spectral data collected at the University Laboratory. Task 3 - Develop intensity standards in the infrared based on studies made with spectral resolution of .02 cm-1 or better. Task 4 - Study the spectra of diatomic molecules like CO and HCl and include in Task III effort. Task 5 - Determine sensitivity of intensity parameter to spectral resolution.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

3.0023, ANALYTICAL STUDIES IN CRACK PROPAGATION OF SURFACE FLAWS AND FLAWS ORIGINATING AT FASTENER HOLES

J.L. RUDD, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

USAF tactical and strategic aircraft structural integrity and safety depends on fracture mechanics predictions of safe operating hours between inspection. Since both surface flaws and flaws originating at fastener holes are commonly found in aircraft components, it is vital that the crack growth behavior of these flaws under loadings pertinent to military aircraft be examined.

Analytical crack growth predictions shall be made for both surface flaws and flaws originating at fastener holes and these results will be compared with available test data. The analytical work shall include cold worked holes containing either loads or unloaded neat fit and interference fit fasteners. Modifications of the fracture mechanics prediction methods shall be made as necessary.

Supporting agency address information: AF Flight Dynamics Laboratory FBE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0024, DEVELOPMENT OF AN IMPROVED RESTRAINT MATERIAL

M. PAULICK, Budd Company, *Fort Washington, Pennsylvania* 19034

The objective is to prove the feasibility of using a high tensile modulus material as a means for improving pilot dynamic response in a high impact condition by reducing dynamic overshoot which results in amplification of the seat acceleration, and to reduce occupant excursion on the seat and prevent submarining. This contract supports W.U. Dk801, Agency Accession No. Dn833218.

Conduct an investigation of new harness materials having high strength and low elongation in the range of 1 plus to 3 plus. Study the harness arrangement of the MA-2 garment, and replace the belt material with at least three different types of low elongation material. A series of dynamic crashes will be conducted to test, evaluate and compare the new material characteristics with the response of the existing MA-2 configuration. Parachute drop tests will be conducted, responses compared and performance improvement evaluated.

Supporting agency address information: Naval Air Development Center, Crew Systems Department (401102), Warminster, Pennsylvania 18974

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0025, ENVIRONMENTAL EFFECTS ON THE DEFORMATION OF POLYMERS AT LOW TEMPERATURES 11782-MC

N. BROWN, Univ. of Pennsylvania, School of Metallurgy, *Philadelphia, Pennsylvania* 19104 (DAHC04-74-G-0121)

To study the basic mechanism of the gas-polymer interaction in terms of the molecular structures of both the gas and the polymer. Relevance: The results of this research may be applicable to the selection of materials for, and the design of, containers used by the Army, and may also be pertinent to the general problem of preventing crazing of polymers that are employed in a wide range of army applications, extending from facial protection for the soldier to canopies and windshields of helicopters.

Experiments will be performed with various gas-polymer systems, and the critical conditions of temperature, pressure, and strain rate at which the embrittling effect disappears will be investigated.

Supporting agency address information: OCRD Army Research Office, Box CM, Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

3.0026, A PHOTOELECTRON SPECTROSCOPIC INVESTIGATION OF SOME MATERIALS OF HIGH POTENTIAL-ENERGY CONTENT 11601-C

J.W. RABALAIS, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213 (DAHC04-74-G-0039)

To investigate the electronic structure of materials of high potential energy content by the application of high-resolution ultraviolet and x-ray photoelectron spectroscopy coupled with semiempirical and ab initio quantum chemical calculations. This investigation of materials with high energy content including azides, nitro and nitroso compounds, and fulminates should provide information important to Army materiel programs for fuels, oxidizers, explosives, and pyrotechnic compositions. In particular information on electron energy levels in these materials will give insight into their properties and reactions. For example, these research results will help to determine mechanisms of thermal and photochemical decomposition.

The photoelectron measurements will be carried out on nitro and nitroso compounds, azides, isocyanates, isothiocyanates, fulminates, cyanamides, organo-metallic complexes containing nitrogen ligands, and phosphorus-nitrogen compounds. Semiempirical molecular orbital calculations will be carried out on these general structures while ab initio SCF MO computations will be used on the smaller species. The experimental and theoretical results will be combined in order to obtain information about the electronic structure of these molecules such as molecular and ionic states, electronic charge distributions, bonding properties, molecular configurations and vibrations, and mechanisms of dissociation and ionization. Molecular ions will be characterized by using conventional and UV induced mass spectroscopy. Theoretical studies of the dissociation of the azide, isocyanate, fulminate, and cyanamide ions along with their corresponding acids are to be conducted by using ab initio SCF methods to obtain the potential surfaces of the appropriate electronic states.

Supporting agency address information: OCRD Army Research Office, Box CM, Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

3.0027, EVALUATION OF HEAT-SEALABLE PACKAGING MATERIALS FOR FROZEN AND REFRIGERATED FOODS

W.T. HOLT, Technology Incorporated, *Houston*, *Texas* (F41609-75-C-0016)

The goal of this effort is to identify and evaluate the various types of heat-sealable packaging materials available within the state- of-the-art and determine which materials are most suitable for use by the Air Force for the various frozen and/or refrigerated food systems. Data from this contract will be used to recommend to Air Force users the most desirable and practical packaging materials for planning of future food systems and improvement of existing systems. Improvements in food packaging are essential to Air Force feeding system since present packages are inadequate to insure a high quality, acceptable food product with sufficient shelf life. Through improved acceptability and increased shelf life, requirements for force feeding or disposal of meals due to expiration can be reduced.

Effort under this project shall consist of survey of current state- of-the-art technology and feasibility test to determine compatibility of plastic and aluminum lids with plastic and aluminum container in all possible combinations thereof to produce a seal capable of withstanding commercial handling and withstand temperatures of minus 40 degrees F. The compatibility determination shall also indicate to what extent commercially available containers permit interchangeability based on size and sealing ability using a single packaging machine.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0028, SOLID PROPELLANT COMBUSTION MODELLING

C.H. BURNSIDE, Rockwell International Corp., *McGregor*, *Texas* 76677 (F44620-75-C-0002)

To improve the design and development of advanced solid rocket motors required by the Air Force for future weapon systems, and at the same time reduce expensive empirical testing, it is necessary to have a truly comprehensive model of the steady state combustion process. Under this program, the new combustion tailoring mathematical steady-state combustion model (AF Contract F04611-67-C-0089) will be checked against available propellant data. A number of improvements will be made to this computer program, by incorporating in the program factors such as exact AP particle size distribution, the effects of aluminum, and the addition of catalysts. Specifically, the goal of this research is to produce a computer program which contains a mathematical description of currently known combustion phenomenology and produces a quantitative and predictive burn rate vs pressure curve for a solid propellant formulation prior to its ballistic evaluation in rocket motors.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0029, PREPARATION OF HIGH DENSITY EXTRUDED AND PRESSED GRAINS OF LOW VULNERABILITY PROPELLANT

F.H. BELL, Thiokol Chemical Corporation, *Ogden*, *Utah* (DAAD05-74-C-0794)

To develop conditions and techniques for the extrusion of high density void-free strands of lova-x1a (75 percent HMX, 25 percent polyurethane) propellant. To develop conditions and techniques for fabrication of high density void-free pressed wafers of lova-x1a propellant. To provide sufficient samples for burn rate determinations and ballistic firings.

Nitramine particle size and particle size distribution will be varied to produce extruded and pressed propellant grains with acceptable burn rate properties.

Supporting agency address information: AMC Ballistic Research Labs., Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, LOW POWER HIGH DATA RATE MODULATOR

G.F. SMITH, Hughes Aircraft Company, *Malibu*, *California* 90265 (F33615-75-C-1028)

Develop a modulator utilizing the e-o effect in an optical waveguide which has a high optical transmission, requires drive voltages on the order of ten volts, provides 100 percent modulation, has a rise time of .2 nanosec, has a capability of handling average powers of 1/2 watt for a mode locked laser at Nd or doubled Nd wavelengths, and a power figure of merit of less than three mw/mhz. The data rate will be in the gigabit range.

Using the techniques of integrated optics the optical beam which is to be modulated is coupled into a thin film waveguide fabricated in a good e-o material (e g, ZnO epitaxially grown of Al2O3 or diffused guides in LiTaO3). Surface electrodes produce an index change in the waveguide thru the e-o effect. Periodic electrodes produce a periodic index change which Bragg deflects the laser beam. The laser beam is thus switched between two angular directions and modulation is observed by viewing either beam.

Supporting agency address information: AF Avionics Laboratory TEO, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0002, INFLUENCE OF TURBINE ENGINE LUBRICANT LOAD CAPACITY ON GEAR SYSTEM DESIGN

F.C. HSING, United Aircraft Corporation, *Hartford*, *Connecticut* 06118 (F33615-74-C-2021)

The objective of this research effort is to provide a quantitative assessment of the advantages and disadvantages of increased lubricant load carrying ability as applied to aircraft accessory and main power transmission gearboxes.

The contractor shall conduct a study and analysis to quantitatively determine the specific design payoffs in the below listed type of propulsion systems that could result from a significant increase in the load carrying ability of these oils: (a) Transport tur-

bofan engine accessory gearbox, (b) Fighter engine accessory gearbox, (c) Turboprop main power transmission gearbox, and (d) Helicopter main rotor gearbox. The contractor shall also determine the maximum usable load carrying ability of the oil for those systems in which a design payoff is identified and quantified.

Supporting agency address information: AF Aero-Propulsion Laboratory SFL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0003, DEVELOPMENT OF CONTROLLED SPEECH STIMULI FOR EVALUATING SPEECH INTERFERENCE EFFECTS OF TIME-VARYING AND STEADY STATE AIRCRAFT NOISE
H.S. COOKER, Univ. of Connecticut, School of Liberal Arts, *Storrs, Connecticut* 06268 (NSG 1082)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0004, RESEARCH IN PACKET BROADCASTING
F.E. KUO, Univ. of Hawaii, School of Engineering, *Honolulu, Hawaii* 96822 (NAS 2-8590)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0005, STREAMWISE VORTICES IN TURBULENT SHEAR FLOWS
H.M. NAGIB, Illinois Inst. of Technology, School of Engineering, *Chicago, Illinois* 60616 (NSG 1120)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0006, AN INVESTIGATION OF POTENTIAL HIGH-PERFORMANCE EJECTOR-DIFFUSER SYSTEMS FOR HIGH ENERGY CHEMICAL LASER SYSTEMS 12882-R-E
A.L. ADDY, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (DAHC04-75-G-0046)

A coordinated analytical and experimental research program is proposed to investigate potential high-performance diffuser-ejector systems with particular emphasis on evaluating a supersonic-supersonic ejector relative to subsonic-supersonic ejectors. This work is directly applicable to one of the major problem areas in chemical laser systems being studied at MICOM.

The technical approach will be to further develop control surface methods for constant-area ejectors neglecting the details of the viscous mixing interface between the two streams. The choked or unchoked situation for subsonic-supersonic ejector and secondary flow compression by mutual interaction of the primary and secondary streams in supersonic-supersonic ejectors are to be considered. A two-dimensional, hydraulic analogy, experimental program will also be carried out.

Supporting agency address information: AMC Research Office, Box CM, Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

4.0007, INFLUENCE OF BLADE LOADING ON THE ACOUSTIC RESPONSE OF A CASCADE
H. ATASSI, Univ. of Notre Dame, School of Engineering, *Notre Dame, Indiana* 46556 (NSG 3037)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0008, PASSIVE AND ACTIVE ELEMENTS OF OPTICAL INTEGRATED CIRCUITS
O.J. MAGEE, Univ. of Notre Dame, School of Engineering, *Notre Dame, Indiana* 46556 (NSG 1102)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0009, COORDINATED RESEARCH DESIGN OF CODING AND MODULATION SYSTEMS
J.L. MASSEY, Univ. of Notre Dame, School of Engineering, *Notre Dame, Indiana* 46556 (NSG 5025)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0010, DISCONTINUOUS MAGNETOFLUIDYNAMIC FLOW
N. GEFFEN, Tel Aviv University, *Tel Aviv, Israel* (AF-AFOSR-2369-72)

For satellite surveillance, ground base maintenance and space communication, advanced plasma dynamics, electric power generation and propulsion systems are required. A more detailed understanding of the behavior of flowing gases and plasmas with or without magnetic fields is required as prerequisite to successful and efficient design, development and control of the complex, often sensitive plasmadynamic systems contemplated. This research aims at a comprehensive description of the motion of plasmas in the one fluid model, which occurs frequently in physical and engineering applications. Included will be analysis and evaluation of steady and unsteady confined plasma flows about given boundaries with either standing or propagating shocks. Advanced mathematical methods, numerical analysis and simulation will be used to deduce the stability of plasmas under selected physical conditions including similarity transformations and solutions, the hodograph plane for steady two-dimensional flows, transformation to characteristic coordinates with a prior estimate of the point (time and location) of shock formation, finite difference methods and a general variational formulation. The methods of treatment will be extended to include anisotropic plasma flows and various dissipative mechanisms. The procedures will be applied to various plasma flows including calculation of hyperbolic (e.g., supersonic, supercritical) and mixed (e.g., transonic) plasma flows, and to the motion of a free-surface liquid conductor which simulates the plasma flow. Experimental determination of the liquid conductor motion will be compared with calculated values.

Supporting agency address information: AF Office of Scientific Research NA, 400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0011, DESIGN GUIDANCE FOR REDUCED LIFE CYCLE COSTS OF ADVANCED SYSTEMS
A. FRAGER, McDonnell Douglas Corporation, *St. Louis, Missouri* 63166 (F33615-74-C-3080)

Today's emphasis on all aspects of the cost problem, makes it imperative that effort be initiated during the early design phase aimed at increasing reliability/maintainability and reducing life cycle costs. Overall objective of study will be to use data analyses techniques and field experience data to identify ways in which the USAF can reduce support costs of future advanced aircraft. Analyses and evaluations derived shall be used as the basis for developing and assembling a design engineer's manual containing recommended design, location, accessibility, test, etc., criteria and design approaches and practices aimed at reduced life cycle support costs.

A program will be implemented for research, identification, collection, categorization, analyses, quantification and evaluation of B-52, B-58, FB-111, A-7d, F-4, F-105, C-141, C-135 and C-130 aircraft cost of ownership field experience data. This historical data base will be derived through contractor research, analyses and synthesis of AFM- 66-1 data, depot reports, design analysis reports, Iros and Able reports, past program case histories and other sources of field experience data.

Supporting agency address information: AF Flight Dynamics Laboratory PTC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0012, DYNAMIC STABILIZATION OF MAGNETIC FLYWHEEL BEARINGS
A.W. SLEESWIJK, Rijksuniversiteit Te Groningen, *Groningen, Netherlands*

A preliminary theoretical investigation has been started to see whether magnetic bearings, which are inherently unstable, can be dynamically stabilized for certain velocity regimes by placing alternating magnet poles on both rotor and stator. The differential equation describing the system cannot be solved analytically: the first computer results look promising. If the stable velocity range is large enough, e.g. spanning velocity ratio of 1:3, the system could be applied to flywheels used for energy storage, and would be inherently safer than dynamically stabilized bearings.

SUPPORTED BY State Univ. At Groningen - Netherlands

4.0013, FATIGUE OF STRUCTURES UNDER RANDOM LOADING
J.C. HOUBOLT, Aeronautical Res. Associates, *Princeton*, *New Jersey* 08540 (F44620-75-C-0035)

Structural fatigue in AF flight vehicles and turbine engines is a major problem. Recent AF experience on its newly procured systems and its current inventory have clearly delineated the magnitude of the problem and its cost to the AF. Accurate prediction of fatigue is the object of a number of AFOSR programs and activities at other af laboratories. These predictions, at the level of reliability required, will depend on a number of factors, e.g. mean stress, environment, load profile, etc. This research project is investigating the interrelationship in a statistical sense of the significant factors in the fatigue process. Initial efforts will focus on load truncation effects and the frequency characteristics of the load spectrum.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0014, DIGITAL/MODULAR AVIONICS
L.J. YOUNGBLOOD, U.S. Army, Avionics Laboratory, *Red Bank*, *New Jersey* 07703

The objective of this task is to design and breadboard a core Army avionic system using digital integration techniques. This type of system will provide the Army pilot with a capability which will simplify his workload by giving him a central control panel, and a general purpose display. In addition, it will provide the flexibility to add or delete from the aircraft configuration with redesign or modification of the basic aircraft installation.

A basic set of Army avionics equipment, including communications, navigation, and identification subsystems, will be selected for bench integration over a digital data bus system. A single keyboard-type control box will be developed to control all subsystems, and a general purpose display will also be developed. Following the bench test phase, the equipment will be installed on a test-bed aircraft for flight tests.

Supporting agency address information: ECOM Avionics Laboratory, AMSEL-VL, Ft. Monmouth, N.J. 07703

SUPPORTED BY U.S. Dept. of Defense - Army

4.0015, UNSTEADY BOUNDARY LAYER FLOWS
J.G. HALL, State University of New York, School of Engineering, *Buffalo*, *New York* 14214 (AF-AFOSR-2719-74)

Weapons delivery, air superiority and logistic support all require the AF to operate and maneuver at transonic speeds. With the trend towards larger and/or higher performance transonic vehicles, engineering design will have to be reduced to a more rigorous science than is now possible with the present state of knowledge or laboratory simulation of transonic flows. Of prime interest for the future will be the ability of the scientist and engineer to obtain model data of unprecedented accuracy in transonic wind tunnels, thereby minimizing the costly consequences of small errors in scaling model results to full scale conditions. Two important features needed in modeling the flow over large, maneuvering aircraft are to obtain a large Reynold's Number, which characterizes the large boundary layer effects, and to produce the unsteady flows, which would result from a maneuver. One unique way of studying transonic, high Reynolds Number, and unsteady boundary layer flows is by means of a Ludwieg Tube. The purpose of this effort is to study, experimentally in the Ludwieg Tube, and theoretically the stability and transition features of unsteady, initially laminar flow, and the characteristics of the subsequent turbulent flow.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0016, 200 CHANNEL FM/CW ILS
UNKNOWN, Amer. Electronics Lab. Inc., *Lansdale*, *Pennsylvania* 19446 (N00019-73-C-0206)

The objective of this program is to provide a two phase R/D effort to evaluate the cost and feasibility of converting the AN/ARA-63 RDG into a 200 channel FM/CW ILS receiver, without changing the present decoding system.

The first phase will be a six months cost benefit analysis plus study of feasible techniques. The second step will only be implemented if the feasibility minimal cost impact to aircraft installation.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0017, RELIABILITY DEMONSTRATION TESTS ON THE IMPROVED ATCRBS ANTENNA
UNKNOWN, Texas Instruments Incorporated, *Dallas*, *Texas* 75222 (055855 (TRAIS NO.))

The Contractor shall furnish the necessary personnel, facilities, services, material and equipment to accomplish the work set forth below: Conduct a reliability demonstration of the improved ATCRBS antennas fabricated by the Contractor under Contract No. DOT-TSC-602. The improved ATCRBS directional and omni directional antennas mounted on the pedestal shall be operated at the Contractor's facility fully exposed to the outside ambient environment for the test period. The continual application of R.F. to the antenna is not required.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production And Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, OPTICAL OBSERVATION OF AURORA WITH HIGH SPECTRAL AND SPATIAL RESOLUTION
A.E. BELON, Univ. of Alaska, Graduate School, *Fairbanks*, *Alaska* 99701

Derive neutral wind pattern in the upper atmosphere and predict its relationship to the aurora. Understanding relationship and position of coupling between the upper and lower atmospheres.

SUPPORTED BY University of Alaska

5.0002, IONIC COMPOSITION IN THE HIGH ALTITUDE IONOSPHERE, THROUGH INCOHERENTLY SCATTERED RADIO WAVES
R. PARTHASARATHY, Univ. of Alaska, Geophysical Institute, *Fairbanks*, *Alaska* 99701

The incoherent scatter facility at Chatanika, Alaska, will be used to investigate the light ion composition at high altitudes in the polar ionosphere. In the region above 500 km a transition occurs in the dominant ion, changing from O ion to H ion. This transition region has been investigated at lower latitudes but not in the polar region. The results are of major interest in connection with the global dynamics of high altitude ionization.

SUPPORTED BY U.S. Natl. Science Foundation

5.0003, NOCTILUCENT CLOUD OBSERVATIONS COORDINATED WITH ROCKET TEMPERATURE SOUNDINGS IN CENTRAL ALASKA - II 12752-GS

W.J. STRINGER, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701 (DAHC04-75-G-0003)

To perform a series of measurements which have a bearing on current theories concerned with cooling of the mesopause (80 km), warming of the stratopause (50 km), and upward transport of water vapor. Observations of noctilucent clouds in coordination with temperature measurements will provide information on vertical atmospheric motions between 50 and 80 km. These motions in turn influence determination of temperature and density values in current atmospheric models which are used in calibration of meteorological satellite systems, in flight programming of large rockets, prediction of nuclear weapons effects, and in design of communication equipment.

To establish an observational site near Healy, Alaska, to photograph noctilucent clouds using a variety of cameras. Volunteer observations of noctilucent clouds in the areas will also be solicited. These observations will be coordinated with rocket temperature measurements from the Army Poker Flats, Alaska, rocket site.

Supporting agency address information: AMC Army Research Office ARO-D, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0004, THEORETICAL STUDIES OF AURORAL ZONE INCOHERENT SCATTER

D.W. SWIFT, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701

Theoretical studies to aid in the interpretation of the data taken with the Chatanika (Alaska) incoherent scatter radar will be carried out. Particular emphasis will be given to interpretation of spectra of E-region echoes where collisions with neutral particles are important. A new theory for the effects of electron neutral collisions on the electron plasma line has been developed. The theory will be extended to include the effect of ion-neutral collisions on the ion plasma line. The effect of D.C. electric-fields will be calculated in an attempt to understand a number of features in the lowest range gate spectrum. Attempts will be made to observe collisional effects in the electron plasma line spectrum.

The objective of the investigation will be to provide a physical basis for interpreting both the ion and plasma line data from the E- region. This will provide valuable diagnostic information from which parameters like the neutral wind speeds, ion and neutral temperatures, ion composition and electron kinetic temperatures might be obtained.

SUPPORTED BY U.S. Natl. Science Foundation

5.0005, X-RAY ENVIRONMENTS IN NON-UNIFORM ATMOSPHERE

W.A. WOOLSON, Science Applications Inc., *La Jolla, California* 92037 (DAAD05-74-C-0775)

To define the complete free-field photon environments produced by nuclear bursts which occur in the high altitude nonuniform atmosphere or whose photon transport encompasses the nonuniform atmosphere. These environments are required for and will be determined in a form suitable for an investigation of balanced hardening assessments of BMD systems.

The approach will be to incorporate the nonuniform geometry capability which is presently in the hart code, into the DART/FLAIR code systems which has been generated by the BRL over the past two years. This code system is arranged such that one has to make only one long run on the computer to generate a data base and the complete descriptions of all photon environments are easily obtained from this data base will practically no more computer time involved.

Supporting agency address information: AMC Ballistic Research Labs, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

5.0006, HIGH ALTITUDE EMP PLASMA DISPERSION

P. VAJK, Univ. of California, Lawrence Livermore Laboratory, *Livermore, California* 94550

The objective of this work is to review the atmospheric plasma effects caused by a high altitude nuclear burst and investigate a reasonable, valid model of the plasma currents which can be used to improve the AFWL emp propagation calculations.

The investigator will review the existing literature and determine the important factors bearing on the problem. A computer model will be developed and modified to be compatible with existing AFWL prediction codes.

Supporting agency address information: AF Weapons Laboratory ELP, Kirtland AFB, New Mexico 87117

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0007, PLASMA DYNAMICS AND INTERACTION WITH HIGH FREQUENCY FIELDS

K.R. MACKENZIE, Univ. of California, Graduate School, *Los Angeles, California* 90024 (AF-AFOSR-2445-73)

The study of nuclear weapon effects requires detailed knowledge of both upper-atmosphere type plasmas and plasmas suitable for the production of x-rays for simulation purposes. The development of high- beta plasmas for basic plasma studies can help provide such knowledge. This research will provide new information on energy exchange within plasmas, magnetic confinement of plasmas, and large volume, uniform, collisionless, high beta plasmas. The plasma properties and processes studied will provide to systems designers an increased capability to control plasmas and to operate systems under optimum conditions. The research objectives include: (1) optimization of plasma confinement with no internal field, (2) confinement of a large volume plasma with a uniform internal field, and (3) the study of plasma energy exchange processes in the absence of charge exchange effects. The research will provide a unique opportunity to study large volume, quiescent plasmas.

Supporting agency address information: AF Office of Scientific Research NPP, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0008, COMBINED PHOTOMETRIC AND INCOHERENT SCATTER OBSERVATIONS

V.B. WICKWAR, Stanford Research Institute, *Menlo Park, California* 94025

Studies of the ionospheric F-region will be conducted with incoherent backscatter radars and photometry of airglow and auroral emissions. The radar facilities at Arecibo, Puerto Rico, and Chatanika, Alaska provide measurements of electron density profiles and other ionospheric parameters requires for the experiment. Tilting filter photometers will be used to measure the radiation from atomic oxygen at 6300 A that are enhanced during the twilight period and under conditions of auroral particle bombardment of the atmosphere. The goal of the research is to provide a better understanding of the physical and chemical processes that govern ionization in the high atmosphere.

SUPPORTED BY U.S. Natl. Science Foundation

5.0009, EARTHQUAKE HAZARDS REDUCTION--LOS ANGELES REGION

D.M. MORTON, U.S. Dept. of the Interior, Geological Survey, *Menlo Park, California* 94025

States to which project pertains: California.

1) Review and synthesis of existing historic, seismic, geologic, geodetic, and marine geophysical records of all faults with known or suspected late Quaternary activity. 2) Study of satellite and high- altitude (1:90,000 to 1:230,000 scale) photography and other imagery for linear and other structural features that appear to reflect late Quaternary tectonic activity. 3) Study of known or suspected young faults by intermediate scale air photos (including low-sun-angle photos), trenching, drilling geophysical surveys, seismic and geodetic networks, hydrologic studies and marine geophysical studies. Determination for each active fault of length, width of hazardous zone, distribution and nature of adjacent landslides, character, rate and chronology of past displacements from historic slip events, dendrochronology, and late Quaternary stratigraphic and geomorphic record. 4) Compilation of a bedrock geologic map at a scale of 1:125,000. Landslides will be mapped

by photointerpretation, and consolidated deposits will be classified and mapped. These, along with program developed in the San Francisco Bay Region, will provide the principal basis for preparation of seismic microzonation maps.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0010, PLASMA TRANSPORT IN THE IONOSPHERE
R.W. SCHUNK, Univ. of California, Graduate School, *San Diego, California* 92038

Rigorous transport equations for the various regions of the ionosphere will be calculated. The effect on the densities and temperatures of processes such as thermal diffusion, thermoelectric transport, viscous stresses, and heat conduction will be determined by solving the appropriate system of transport equations. The investigation will (1) determine the effect that electric field induced stresses have on ion densities and temperatures in the high latitude E- region, (2) calculate general diffusion equations for the mid-latitude ionosphere that contain thermal diffusion and thermoelectric effects, (3) calculate production and loss collision terms for the complete 13- moment system of transport equations, and (4) obtain a numerical solution of the complete 13-moment system of transport equations for polar wind conditions.

SUPPORTED BY U.S. Natl. Science Foundation

5.0011, ELECTROMAGNETIC EMISSIONS
J.N. BARFIELD, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

Project objective: Provide Explorer 45 data on generation of electromagnetic emissions during substorms.

Current year plan: The CDC 3800 will be used to provide this data.

SUPPORTED BY University of California

5.0012, MICROWAVE RADIOMETRY
M.T. DECKER, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

Research/service objective: Theoretical and experimental study of microwave emission, absorption, and scattering by atmospheric constituents to determine the usefulness of radiometry for remote sensing and atmospheric science purposes.

Research/service plan: Develop radiometric techniques for deriving liquid/ice content of clouds and other cloud parameters; evaluate cloud effects on radiometric remote sensing of other atmospheric properties; continue work on application of inversion techniques.

Progress report: Showed that water vapor refractivity can be accurately estimated by microwave radiometry; conducted Haswell field test for boundary layer temperature profile retrieval from O2 emission near 60 GHz; advanced inversion methodology by comparative study of 3 techniques; evaluation of effects of errors, and application to retrieval of temperature and water vapor profiles and partical size distribution; made preliminary measurement of liquid content of a snowing cloud.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0013, SUNSET RADAR
J.L. GREEN, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

Research/service objective: To construct and operate a large VHF scatter radar at the Sunset Field Site to make wind and turbulence measurements in the troposphere, stratosphere, and mesosphere.

Research/service plan: Construct radar system which will include a 15,000 m2 antenna, steerable in EW plane, a 100 KW transmitter, and a computerized data processing system. Conduct range-intensity measurements from 3 to 60 km. Conduct preliminary measurements of wind velocity and turbulence spectra.

Progress report: The Radar System was designed and the component materials and equipment specified. The receiving and data processing system was designed and constructed. A suitable site was selected and procured.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0014, AURORAL ELECTROJETS
M. SCHERER, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

Objective: Gain an understanding of irregularities in the electrojet current regions in the auroral and equatorial ionsphere.

Plan: Complete final version of a computer program to simulate two-stream turbulence in the equatorial and auroral electrojets. The program will be used to obtain results which can be compared with the radar backscatter studies.

Progress: A four-part computer simulation of two-stream ('Type I') electrojet plasma turbulence and the resulting ionospheric irregularities will be developed. Programming for the electrostatic potential solver and the electron dynamics solver has been completed to date.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0015, ELECTRON COLLISION PROCESSES IN ATMOSPHERIC GASES 11041-P
G.J. SCHULZ, Yale University, School of Engineering, *New Haven, Connecticut* 06520 (DA-ARO(D)-31-124-73-G66)

Experimental studies using electron beam techniques will be directed toward the goal of providing accurate measurements and improved physical understanding of electron impact cross sections in atmospheric gases and other gases of technological interest. The research, being concerned with atmospheric gases and with an emphasis on low energy behavior of collision processes, is basic to defense work concerned with plasmas, during and in the afterglow of nuclear/electrical disturbances, and in reentry physics. Several of the gases being studied are candidates for low or high power lasers.

Resonances, negative ion formation and vibrational cross sections will be measured in triatomic and more complex molecules- the energy distribution of electrons and the energy dependence of cross sections in associative detachment will be measured using ion beams.

Supporting agency address information: OCRD Research Office Durham, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0016, RIOMETER MEASUREMENTS IN GREENLAND
P. STAUNING, Danske Meteorologiske Institut, *Lyngby, Denmark* (AF-AFOSR-2542-73)

AF function - communications, navigation, detection and surveillance. Deficiency - insufficient knowledge concerning the absorption of radio waves by the ionosphere. Research - the grantee will operate and maintain a 30 MHz riometer at a station in Godhavn, Greenland. The objective is to determine ionospheric absorption by continuous ground-based absorption measurements utilizing cosmic radio noise signals. How research contributes - The absorption measurements obtained from riometer data will be used to help determine the effects expected on oblique propagation transmission.

30 MHz riometer data will be provided to AFCRL for incorporation with data from other stations in studying the effects of disturbed polar ionospheres on AF systems.

Supporting agency address information: European Office of Aerospace Rsch. & Dvlpmt. NRP FPO, New York 09510

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0017, HIGH ALTITUDE BURST EMP
W.T. WYATT, U.S. Army, Harry Diamond Labs., *Washington, District of Columbia* 20310

(a) Development of a 1-D finite difference code to solve the 3-D vector Helmholtz Equation in the congruent ray approximation for high altitude nuclear bursts. (b) Development of a 2-D finite difference code to solve the above Helmholtz Equation in the azimuthally congruent ray approximation for such bursts. (c) Documentation of the above.

(a) A stability analysis will be performed for each code. (b) Each code will be developed using available implicit techniques. (c) Preliminary versions for zero air conductivity will be developed and compared with the 'high frequency' approximation. (d) Final versions will evaluate finite air conductivity and

utilize variable spatial gridding. (e) Source currents and ionization will be specified by routines contained in the Nephi Dode.

Supporting agency address information: AMD Harry Diamond Laboratories, Washington, D.C. 20310.

SUPPORTED BY U.S. Dept. of Defense - Army

5.0018, SPATIAL AND TEMPORAL PERTURBATION OF OZONE BY SOLAR ACTIVITY AND STRATOSPHERIC WARMINGS

S.S. PRASAD, Univ. of Florida, School of Arts, *Gainesville, Florida* 32601 (NSG 5026)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0019, DATA ANALYSIS SYSTEM DEVELOPMENT

P.C. COOK, U.S. Dept. of Commerce, Fisheries Engineering Lab., *Miami, Florida* 33149

Objectives: a. Establish systems to decrease data processing time and cost, and to provide increased accuracy and objectiveness in the resulting data. b. Develop systems to automatically acquire continuous data in machine compatible formats which will obviate manual data handling and result in near real-time availability for analysis and prediction. c. Develop systems to display vast areal data parameters facilitating comprehensive management of living marine resources. d. Develop correlations between sea truth data and remotely sensed oceanographic parameters to provide indicators of living marine resources.

Approach: The activities are those which deal with the development of systems that will support other requirements, or methods for displaying and correlating data obtained from various sources. A significant portion of the activity associated with this task is in the analysis and evaluation of the data acquired by the remote sensing systems and techniques described under Data Acquisition, and in the development of software packages and processing techniques to enhance the value of the synoptic survey devices.

Since satellite systems, and most airborne systems, primarily sense oceanographic features rather than biological features, oceanography is emphasized. The purpose is to analyze and evaluate the oceanographic features that can be sensed, verify the data with corresponding sea truth information and develop correlations with biological findings. It is anticipated that through these correlations meaningful use of remote sensing of living marine resources can be achieved.

Planned activities 1975: Determine and develop a cruise track optimization system for use during planning and execution of research cruises. Convert existing card image tapes of the Pascagoula Data Base to a data file compatible with existing MIS. Provide a series of catch and effort rate distribution plots of exploratory fishing activities for coastal North Carolina.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0020, CORRELATION OF THE EARTH'S ROTATION RATE AND THE SECULAR CHANGE OF THE GEOMAGNETIC FIELDS

R.S. JIN, Florida Agric. & Mech. Univ., School of Science, *Tallahassee, Florida* 32307 (NSG 5038)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0021, MULTI-ION DRIFT TUBE ANALYSIS

I.R. GATLAND, Georgia Inst. of Technology, School of Physics, *Atlanta, Georgia* 30332

The application of a general solution that describes drifting, diffusing and interconverting ion swarms, to the analysis of drift tube experiments with several ionic species will be investigated. Characteristics of the time of arrival spectra will be determined for each simplified solution, and methods for obtaining drift, diffusion, and reaction coefficients from experimental data will be developed.

SUPPORTED BY U.S. Natl. Science Foundation

5.0022, TOXIC ELEMENTS AND ORGANIC DEGRADATION PRODUCTS IN AQUATIC BODIES AND SEDIMENTS AROUND KSC

G.S. GHUMAN, Savannah State College, Undergraduate School, *Savannah, Georgia* 31400 (NSG 803)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0023, INVESTIGATION OF FRESNEL LENS UTILIZATION IN COLLECTING SOLAR ENERGY FOR POWER GENERATION

UNKNOWN, Ball State University, Graduate School, *Muncie, Indiana* 47306 (NGA 8-101)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0024, SURVEILLANCE - AMPLITUDE INTERFEROMETRY

D. CURRIE, Univ. of Maryland, School of Arts, *College Park, Maryland* 20740 (N00014-67-A-0239-0030)

The objective of this project is to investigate the feasibility of using amplitude interferometry techniques for high resolution surveillance of satellities and other objects in space. This will include demonstrations of high resolution measurements through the turbulent atmosphere, measure various parameters of the atmosphere affecting the resolution and sensitivity of amplitude interferometer devices, upgrade existing equipment, and to explore computer methods for image reconstruction from data obtained by amplitude interferometry.

A filled multiaperture amplitude interferometer will be designed, developed, fabricated and tested. The detection system will be such that interferometry can be performed on elements of the aperture of varying sizes in order to accommodate day to day and site to site variations in the size of the coherent atmospheric aperture.

Supporting agency address information: Office of Naval Research 421, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

5.0025, RADIO PROPAGATION IN DISTURBED IONOSPHERES

J. BUCHAU, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - communications via and through arctic and other disturbed ionospheres and OTH radar. Deficiency - incomplete understanding of disturbed ionosphere and its effects on communications, navigation and OTH radar. Research - arctic propagation experiments conducted by airborne ionospheric laboratory and the Goose Bay Ionospheric Observatory (GO). Study effects of the ionosphere on radiowave propagation in terms of auroral absorption, mode availability, Doppler spread. Development of gioreal-time ionospheric specification. Improved understanding of gradients, irregularities and rapidly varying and disturbed ionospheric conditions on EM propagation. How research contributes - aids the development of OTH radar systems such as 4141 4401, survivable communications systems, and satellite systems such as AFSATCOM. GPS and DSCS in terms of improved design, and operations. Improvements are in the areas of bandwidth, power requirements, frequency management, antenna design, system accuracy and reliability assessment and operational employment procedures.

This work unit makes use of the airborne ionospheric observatory and Goose Bay Ionospheric Observatory to study ionospheric gradients in cross section for specific propagation paths under varied ionospheric conditions for various propagation modes. This allows testing of ionospheric models and ray tracing models needed to design and operate OTH radar systems. A report on first phase of an oblique hf propagation study will be completed by Dec. 1974. A further ground/air oblique propagation study will be executed, with eight flights during FY75. installation of aircraft FM/CW receiver will be accomplished during FY75. The vhf receiver will be flown on the aircraft for first demonstration of satellite vhf reception in the vicinity of scintilla-

tion by Oct. 1974. Report on the state of the ionosphere modeling and 3hD ray-tracing will be prepared by Jan. 1975 for DNA.

Supporting agency address information: AF Cambridge Research Laboratories Li, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0026, STUDIES OF IONOSPHERIC STRUCTURE

R.J. CORMIER, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - global communication and surveillance. Deficiency - as the complexity and degree of required precision for modern surveillance and communication systems increase, the need for correspondingly more precise and timely ionospheric data also increases. Objective - develop techniques for real-time computer processing of routine vertical ionospheric soundings. Study the short and long term ionospheric variations using semi-automatic data processing techniques. Couple these results to ionospheric modelling programs. How research contributes - huge amounts of data are required to be collected and dispersed by the Air Weather Service Global Weather Central and data handling is a matter of real concern. Any techniques for automating these procedures is of potential value. Real-time radar corrections involve massive amounts of data handling and reduction at the radar site, so that digital automation techniques are also of great importance in this application.

The digital ionospheric sounder (Digisonde 128) located at Sudbury Annex of the Army Natick Laboraties will be operated on a routine basis, recording data on magnetic tape. Techniques will be developed to recognize and isolate entire ionograms from noise and interfering signals. This being the first step toward identifying the various ionospheric parameters, for example critical frequencies and virtual heights. Once this is accomplished one can easily input to a true height program. One effectively has an automatic true-height profile. The current approach is limited to a mid-latitude station, namely the Sudbury Annex. Also to be investigated is ionsopheric absorption taking advantage of the Digisonde's ability to obtain amplitude information. Absorption measurements observed at two different sites will be compared to determine possible a latitude variation in seasonal absorption behavior. The two sites being considered are the Sudbury Annex and Goose Bay, Labrador, both sites have a digisonde 128.

Supporting agency address information: AF Cambridge Research Laboratories Li, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0027, RADIATION TRANSPORT

J.I. KING, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - deleterious effects on stratosphere resulting from B1 flight operations. Deficiency or opportunity - pollutant exhaust gases can trigger kinetic reactions which deplete stratospheric ozone shield which in turn affects atmospheric radiative heat balance. Objective - to model the environmental impact of high altitude aircraft on the stratospheric heat balance. How research contributes - makes possible impact assessment of system and suggests methods of minimizing harmful effects.

Formulation of a radiation transport model for the naturally-occurring, optically active molecules which reproduces the main features of the stratospheric thermal profile, 2) study of radiation effects caused by chemical and aerosol additives to the stratosphere, and 3) investigation of the coupling of the stratospheric thermal regime to the dynamics of tropospheric general circulation.

Supporting agency address information: AF Cambridge Research Laboratories OP, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0028, ANALYSIS OF GEOMAGNETIC MICROPULSATIONS

E. MAPLE, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF functions - communications and surveillance. Deficiency - knowledge and prediction of geomagnetic disturbances. Objective - to provide a description of micropulsation activity at a mid-latitude station and to study the development of hydromagnetic wave disturbances. How research contributes - high levels of geomagnetic activity adversely affect the operational capabilities of HF communications and perturb satellite orbits. Completion of the objective will permit the identification of unusual features of the real-time data to be obtained from the afcrl magnetic activity network which can be used as indicators or predictors of high levels of magnetic activity.

Theoretical, phenomenological, and empirical studies will be made. In FY 75, a theoretical analysis will be made of the development in time and space of hydro-magnetic waves in both the isotropic and guided modes which are generated by a given initial disturbance. The first case to be considered has the isotropic wave in an uncoupled eigenstate and will serve to reveal the transition between uncoupled and coupled mode phenomena. Computer programs for obtaining maximum entropy spectral analyses and polarization parameters of hydromagnetic waves will be developed for use with the AFCRL magnetic activity network data. Individual micropulsation wavetrains recorded during three intervals when the Sudbury, Massachusetts field station was near or inside the southern boundary of the auroral oval will be studied in detail during FY 75. This will provide better means of recognizing these disturbance- related phenomena in future data and will supplement a statistical study of a larger data sample which has been completed.

Supporting agency address information: AF Cambridge Research Laboratories PH, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0029, GLOBAL CLIMATIC MODELING

S.E. MUDRICK, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - military operations involving Air Force vehicles used by strategic, tactical and general purpose forces. Deficiency - current or anticipated Air Force operations in the stratosphere may modify the gaseous or aerosol composition sufficiently to affect the photochemical and radiation balance of the stratosphere. Objective - to predict the global climatic consequences of any major perturbation of the stratosphere. How research contributes - research will improve modeling of global weather and climate by incorporating stratospheric processes and perturbations into mathematical models of the atmosphere.

The approach is to construct mathematical models which include the appropriate physical processes and the important gaseous and aerosol constituents. A limited test model will be developed which will include most of the relevant processes in order to test a range of photochemical rate parameters and turbulent diffusion coefficients. The test model will be multi-level and time dependent, but it will be zonally averaged.

Supporting agency address information: AF Cambridge Research Laboratories LY, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0030, CHEMISTRY OF THE UPPER ATMOSPHERE

W. SWIDER, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - communications and satellite surveillance. Deficiency - inadequate knowledge of the atmosphere, particularly during natural or man-made disturbances. Objective - study and analysis of ionospheric-atmospheric data plus laboratory measurements of certain processes. How research contributes - studies and measurements help correct deficiencies in theories and models, which lead to an improved ability to forecast visible and IR backgrounds plus radio absorption and propagation effects during atmospheric disturbances.

Experimental atmospheric data is compared with theoretical models. New interpretations are formulated to explain properly results where necessary and possible. Laboratory measurements are made of reactions thought to be of special importance during and after disturbances in the atmosphere and their effects on systems considered.

Supporting agency address information: AF Cambridge Research Laboratories OP, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0031, TROPOSPHERIC REFRACTIVE BENDING
L.E. TELFORD, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - communications, navigation. Deficiency or opportunity - present methods for correcting for tropospheric refractive bending assume a horizontally stratified atmosphere. For low elevation angles these methods usually fail since the ray traverses long horizontal distances and the assumption of horizontal stratification is not valid. Objective - develop and test a tropospheric refractive bending prediction system which uses surface refractivity plus atmospheric emission data in the millimeter wave region of the electromagnetic spectrum. How research contributes - this research will determine whether it is feasible to use atmospheric emission measurements to obtain refractive bending corrections.

Accurate measurements of refractive bending using the sun and the moon as targets and the measurement of atmospheric emission at frequencies between 15 and 55 GHz are conducted simultaneously and the two sets of data are correlated.

Supporting agency address information: AF Cambridge Research Laboratories LZ, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0032, IONOSPHERIC AERODYNAMICS RELATED TO SPACE VEHICLES, SPACE SHUTTLES, AND SATELLITES
R.S. ONG, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (AF-AFOSR-2224-72)

Satellites, space shuttles, ballistic missiles, and other space vehicles at high altitudes move through a high temperature ionized gas called a plasma. Plasmas are also present in the combustion products of rocket motors. The plasma can significantly modify, scatter, absorb, or reflect radar and other electromagnetic waves, and it is responsible for the so-called high altitude plume phenomenon. This is a theoretical effort to better understand the propagation and growth of waves which are fed energy from the inhomogeneities of density, temperature, and velocity shear layers present in high altitude plasmas. A particular focus for the current year is the analysis of the propagation of very low frequency ion acoustic waves at high altitude through the ionosphere to the lower atmosphere where the waves are neutral particle sound waves. Previous analyses have neglected the important effects of electron neutral collisions in the partially ionized lasers, and these will be taken into account. This problem is of interest because of the possibility, by ground level monitoring of the low frequency waves emitted by a spacecraft at very high altitudes, of determining the direction and speed of the vehicle. Other attractive applications are also feasible.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0033, A CASE STUDY OF THE RELATIONSHIP BETWEEN WATERSHED USE AND ECOLOGICAL STREAM WATER QUALITY
K.W. CUMMINS, Michigan State University, School of Natural Sciences, *East Lansing, Michigan* 48824

The objective of the proposed research is to relate watershed data (land and water uses) to an extensive and unique set of existing ecological data on a southern Michigan trout stream. Measurements of vegetation cover and land use patterns will be made using a combination of color infrared aerial photography and measurements on the ground. Vegetation transects at right angles to the stream channel will constitute the major 'ground truth' verification. Inputs of organic matter (carbon, nitrogen and phosphorus) will be estimated from samples collected from selected permanent and intermittent channels and surface runoff following storms. Particulate organic inputs will be collected in litter traps.

Mark and recapture studies together with 'creel census' data will be employed to evaluate the size, distribution and degree of exploitation of the trout populations.

The major ecological stream data available for correlative use are P/R ratios (gross photosynthesis to community respiration) and leaf litter decomposition rates on a seasonal basis for selected locations in the drainage.

The results of the correlation of watershed and stream ecological data should serve as a valuable case study leading to management strategies to be developed for moderate size, multiple use watersheds in the upper midwest.

SUPPORTED BY U.S. Dept. of Interior - O.W.R.T.

5.0034, DIFFERENTIAL ICE DEFORMATION - A PHOTOGRAMMETRIC EXPERIMENT
W.F. WEEKS, U.S. Army, Cold Reg. Res. & Engin. Lab., *Hanover, New Hampshire* 03755

It is proposed to study the differential ice deformation within the AIDJEX manned triangle in order to obtain the displacements and velocities and displacement rates at any desired point within the 100 km manned triangle. This will serve as a ground truth check on modeling calculations. Data will be obtained through photoimagery with the aid of NASA-U-2 aircraft flying over the research area at altitude of 18,300 to 21,300 meters.

SUPPORTED BY U.S. Natl. Science Foundation

5.0035, IR IMAGING STUDIES
T.G. PITTS, U.S. Air Force, Rome Air Development Ctr., *Rome, New York* 13442

To study the degrading effects of the atmosphere on the propagation of 10.6 micron images.

A 10.6 micron dual channel imaging system is used to view two point sources propagated over a 5000 foot horizontal path. The knowledge of the atmospheric psf gained from one point source is used in a Fourier convolution technique to restore the second image. A measure of the temporal and spatial aspects of the atmospheric distrubances is gained. The data is correlated with meteorological turbulence data to obtain a knowledge of the effects of the strength of turbulence.

Supporting agency address information: Rome Air Development Center OCS, Griffiss AFB, N.Y. 13440

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0036, NAVY ENVIRONMENT - IMPACT OF HIGH PERFORMANCE AIRCRAFT ON OZONE BALANCE OF STRATOSPHERE
E. HESSTVEDT, Univ. I Oslo, *Oslo, Norway* (N00014-74-C-0033)

Further develop an existing two-dimensional model of the stratospheric ozone layer so that it will more faithfully represent the impact of engine emissions of high performance military aircraft now transiting the stratosphere.

Use existing rate constants for reactions between ozone and various nitrogen oxides (NOx) to develop a two-dimensional model of the stratospheric ozone layer. Use accumulating data on variation of NOx profiles with latitude and season to make model more realistic. Use model to estimate effect of engine effluent of high performance asrcraft on stratospheric ozone assuming various engine effluent rates, routes, and number of aircraft.

Supporting agency address information: Office of Naval Research 465, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

5.0037, ATOMIC AND MOLECULAR PROCESSES IN ATMOSPHERIC ENVIRONMENTS 11427-P
M.A. BIONDI, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213 (DAHC04-73-C-0037)

Studies will be made of nightglow ionospheric modification. These studies will give insight into the non-equilibrium (strong plasma instability) electron heating mechanisms.

It is proposed to use spatial scanning filter photometer to study further the various optical excitation and quenching

processes in the upper atmosphere which have a bearing on the optics and Ivy-Owl programs.

Supporting agency address information: AMC Army Research Office ARO-D, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0038, AIRGLOW AND AURORAL STUDIES OF THE EARTH'S IONOSPHERE

M.A. BIONDI, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213

Airglow and auroral phenomena in the earth's ionosphere under normal, naturally disturbed, and artifically perturbed conditions will be investigated with ground based observations. The observations will be carried out principally at the University of Pittsburgh Airglow Observatory at Laurel Ridge, Pennsylvania and at the Arecibo Observatory in Puerto Rico. Measurements from NASA's Convair 990 airborne platform may also be carried out. The problems to be investigated include the origin of terrestrial atmospheric sodium, neutral winds in the E and F regions, exospheric temperature studies, and participation in ionospheric modification experiments.

SUPPORTED BY U.S. Natl. Science Foundation

5.0039, ATOMIC AND MOLECULAR PROCESSES IN ATMOSPHERIC ENVIRONMENTS 11427-P

W.L. FITE, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213 (DAHC04-73-C-0037)

To study neutral-neutral reactions using crossed beam techniques. production of infra-red radiation following a nuclear disturbance in the atmosphere. Also, the production of possibly very long lived ions that are immune to destruction through dissociative recombinations.

In this program molecular beams of two neutral reactants intersect and the products of reaction are detected either mass spectrometrically or, for radiating products, photoelectrically. Attention will focus on the reaction U plus O 2 yields UO plus O to determine the internal energy which the product uo contains and thus permit the estimation of IR spectra that the excited products would radiate.

Supporting agency address information: AMC Army Research Office ARO-D, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0040, ATOMIC AND MOLECULAR PROCESSES IN ATMOSPHERIC ENVIRONMENTS 11427-P

F. KAUFMAN, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213 (DAHC04-73-C-0037)

To study infrared emission from recombination and energy transfer processes. The measurements will elucidate some of the infrared background processes which occur in the natural upper atmosphere and are a significant part of the optics program. They will likely clarify some excitation reactions of doubly charged CO2 and H2O important in plume physics, and they will provide some of the important vibraluminescence reaction parameters applicable to post-nuclear burst conditions which are required in the Ivy-Owl program.

Absolute intensity measurements in the short and intermediate infrared region will be carried out using laboratory flow system, discharge or photolytic excitation methods, spectral dispersion by circularly variable filters, and detection by cooled PbS, InSb, and other detectors. Information will also be obtained on quenching processes of the various emitters by various emitters by variable, time- resolved introduction of precursor and quencher molecules of doubly charged CO2 and H2O.

Supporting agency address information: AMC Army Research Office ARO-D, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0041, LABORATORY STUDY OF THE NITROGEN AFTERGLOW

D.E. SHEMANSKY, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213

This action amends grant DES7100341 and allows completion of the studies of the nitrogen afterglow reactions and their application to problems of the upper atmosphere.

SUPPORTED BY U.S. Natl. Science Foundation

5.0042, ATOMIC AND MOLECULAR PROCESSES IN ATMOSPHERIC ENVIRONMENTS 11427-P

E.C. ZIPF, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213 (DAHC04-73-C-0037)

To study atmospheric ion/neutral density measurements. The increasing sophistication and complexity of the current payloads permit measurement of a large number of atmospheric parameters simultaneously under steady-state or transient conditions. Such measurements are essential if an adequate theory of the ion production and removal processes in the upper atmosphere is to be developed.

A light-weight, high resolution quadrupole mass spectrometer has been developed that is capable of measuring both the ion and neutral composition of the upper atmosphere. This instrument has been flown seven times as part of several complex payloads designed to explore the airglow, and the ion and neutral chemistry of the quiet and distrubed atmosphere. These experiments have included dawn, twilight and auroral flights. A daylight ionospheric experiment will be made. Auroral studies which involve both optical and composition measurements will also be conducted. Additional auroral experiments in conjunction with the Canadian Goverment are planned.

Supporting agency address information: AMC Army Research Office ARO-D, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0043, IMPROVEMENT OF REMOTE SENSING TECHNOLOGY AND ITS APPLICATION TO CORN YIELD ESTIMATES

V.I. MEYERS, South Dakota State University, Remote Sensing Institute, *Brookings, South Dakota* 57006 (RD-12)

Objective: Study variability of photometric characteristics in relation to variability of solameter data. Measure the influence of atmospheric attenuation and interference on photographic and scanner imagery and establish corrective procedures for estimating corn yields. Investigate the application of pattern recognition procedures to crop identification.

Approach: Ascertain, under stable sunlight, relationships between film exposed at various F stops on different cameras with the light intensity monitored by solameters with similar filters as compared with a partially cloudy day. Compare radiation responses for solameters at ground level, under aircraft and on top of aircraft to develop procedures for correcting reflectance from terrain in sample corn fields. Use factor analysis, linear regression, analog procedures, discriminant functions and SODACIS in crop identification.

Progress: Thru experiments, controlled field and pattern recognition, were conducted. The objective of the control experiment was to study the variability of solameter data. Results indicated cameras, F stop setting and type of day were significant sources of variation in photographic densities. Using radiometric measuring devices equations were generated to correct film density for the type of day the film was exposed. Altitudes, dates of flights, fields and many interactions of these factors were significant sources of variation in film density in this experiment. Correlations between film density and corn plant characteristics indicated the first week of August was the best time to estimate corn yield with film density. The objective of the pattern recognition experiment was to investigate the application of certain pattern recognition procedures to crop identification. The K- class classifier was able to identify up to 10 crops with an accuracy between 60 and 80 percent. It was found that a priori information increases overall classifications accuracy by increasing the classification accuracy of the larger classes. Film 2443 provided a more accurate classification of crops than did 2448 with the 1220 meter altitude giving better results than the 610 meter altitude.

SUPPORTED BY U.S. Dept. of Agriculture - S.R.S.

5.0044, FUNDAMENTAL TURBULENCE
T.W. HORST, Battelle Memorial Institute, *Richland, Washington* 99352 (AT (45-1)-1830)

The structure and dynamics of atmospheric turbulence in the planetary boundary layer will be studied both experimentally and theoretically with the goal of predicting turbulence levels in the atmosphere, an essential input to the calculation of the resultant diffusion, deposition and resuspension of atmospheric contaminants.

The recently completed aircraft sonic anemometer will be mounted on the aircraft along with the motion system for comparison with compatible tower-mounted instrumentation. It will then be utilized, along with a balloon-borne vertical profile system, for data collection throughout the depth of the planetary boundary layer.

Data analysis for the development of spectral models from previously collected tower data will be completed in FY-1975. Analysis emphasis will then shift to the newly-collected boundary layer data.

Results: The aircraft sonic anemometer was constructed and tested in the wind tunnel. Spectral models were developed for the stable tower data which emphasized their organization with dimensional frequency. Detailed studies were made of the horizontal coherency of turbulence and its decay with distance in the alongwind direction.

SUPPORTED BY U.S. Energy Res. & Development Admin.

5.0045, RESEARCH AIRCRAFT OPERATIONS
C.L. SIMPSON, Battelle Memorial Institute, *Richland, Washington* 99352 (AT(45-1)-1830)

The objective of this program is to provide a research aircraft for ongoing AEC-DBER Atmosphere Sciences research programs. Aircraft measurements play a vital role in obtaining data for assessing the atmospheric mechanisms that bring about the dilution and transport of materials and their removal to the earth's surface. With the completion of the instrumentation, installation measurements of tracer concentrations can now be made out to distances on the order of 100 km. In addition, the aircraft can be used as a platform for releasing as many as twelve noninterfering tracers either simultaneously or in sequence into storm systems to obtain data for determining storm characteristics. For turbulence measurements a vertically-stablized, three-axis accelerometer system in conjunction with a three-component turbulence sensor has been mounted on the nose of the aircraft allowing for definition of orthogonal wind components over an extended frequency range.

Results: Aircraft has been used successfully for two years in METROMEX project at St. Louis by releasing tracers into storm systems and obtaining profiles of SO2, measuring particle size distributions, and condensation and freezing nuclei studies. For turbulence investigations a nose boom has been tested using accelerometers to quantitatively measure the motions of the boom relative to the aircraft. SF6 tracer has been successfully measured in a number of flights under different atmospheric conditions, and a cloud droplet spectrometer has been installed and successfully operated.

SUPPORTED BY U.S. Energy Res. & Development Admin.

5.0046, SHEAR FLOW EFFECTS IN CONSTANT DENSITY AND STRATIFIED FLOWS
W.O. CRIMINALE, Univ. of Washington, School of Arts, *Seattle, Washington* 98105 (AF-AFOSR-2579-74)

Air force flight operations in the atmosphere require the capability for safe operation under all types of atmospheric conditions, including the combined effects of wind shear, density stratification, and propagation and breaking of internal gravity wave motion of the atmosphere. The often severe disturbances called clear air turbulence are most likely connected with some of these phenomena in ways which are at present imperfectly understood. This research is investigating internal gravity waves for possible mechanisms of focussing and breaking through the interaction of crossing waves in different directions of propagation, also the special aspects of very large scale atmospheric and oceanic boundary layers.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0047, COORDINATED BALLOON-BORNE AURORAL X-RAY AND PHOTOMETER EXPERIMENT AND IMAGING OF X-RAY AURORAS FROM THE ATS-F SATELLITE CONJUGATE REGION
G.K. PARKS, Univ. of Washington, School of Arts, *Seattle, Washington* 98105

This grant supports the continued research on x-rays emitted by precipitating auroral particles, and the comparison of this data with satellite experiments. This is the second year of the two-year continuing grant GA-43115X.

SUPPORTED BY U.S. Natl. Science Foundation

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, DEVELOPMENT OF A CONTAMINATION FREE SERUM AND URINE COLLECTING SYSTEM FOR THE EVALUATION OF TRACE METALS IN USAF AIRCREW MEMBERS
R.N. KNISELEY, U.S. Energy Res. & Dev. Admin., *Ames, Iowa*

Tissue trace metal levels have been demonstrated to decrease in populations with a high incidence of coronary artery disease. Changes in serum trace metals have been found in malignant disease and changes in urine trace metals have been found in diabetes and hypertension. In order to improve the selection and retention of USAF aircrews, it is necessary to monitor these essential trace elements in the flying population. Attempts to measure trace elements routinely on aircrew members seen by the SAM Consultation Service (project 77550508) have been unsuccessful because trace element impurities present in the blood and urine collected have rendered our data meaningless. This effort will be directed toward the solution of this contamination problem.

The Ames Atomic Energy Laboratory will attempt to develop a contamination free collection system and provide a manual on its proper use. It is possible that an improved vacutainer system for the collection of blood samples can be devised from some type of plastic that contains minimal amounts of trace element contaminates, or a contamination free plastic coating devised to line ordinary urine collection bottles. Both these areas of investigation will be pursued in an effort to solve the contamination problem.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0002, BIODYNAMIC RESEARCH
W. HOVEY, Univ. of Dayton, Research Institute, *Dayton, Ohio* 45409 (F33615-72-C-1402)

Air Force function - operational environments expose aircrew personnel to deleterious vibration stress, deficiency - human performance response to chronic and acute vibration stress is not sufficiently well understood to permit optimization of manned weapon system design. Research - provide instrumentation and data analysis assistance for in-house experiments, to include advancement of analogous biodynamic models. How research contributes - aids in determining the environment and in relating biodynamic response characteristics of humans exposed to mechanical forces encountered in Air Force operations to system design parameters.

Contractor analyses on-going in-house experimental protocols, installs appropriate instrumentation system from available equipment, collects and analyses data from said experiments and provides modelling techniques to aid in analysis and application of data.

Supporting agency address information: 6570 Aerospace Medical Rsch. Lab BB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0003, ANTHROPOMETRIC AND BIOMECHANICAL REQUIREMENTS FOR DYNAMIC HEAD, ARMS AND FEET SUPPORT IN HIGH GZ ACCELERATION

M.M. AYOUB, Texas Technological University, School of Engineering, *Lubbock, Texas* 79409 (F33615-75-C-5013)

The objective of this effort is to develop, through appropriate analysis of anthropometric and biomechanical information, design criteria for dynamic head and limb supports to permit continued operation of aircraft controls by the pilot during high plus gz accelerations to 10g. Attention shall be given to the expansion of possible control locations beyond those currently available with unaided and unsupported limbs during high plus gz accelerations. This study is intended to supplement current programs concerned with the development of high-g body support systems and aircraft cockpits.

The contractor shall analyze current data of anthropometric and biomechanical nature and the derivation of selected three-dimensional anthropometric data using the AMRL/HEO photogrammetric facility at Wright-Patterson AFB. Data will be extracted using the AMRL/HEO x-y digitizer. The contractor is required only to study thoroughly the specific aspects of dynamic head and limb support and make recommendations regarding their application to the design of such supports.

Supporting agency address information: 6570 Aerospace Medical Rsch. Lab HE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0004, ACQUISITION ENGINEERING SUPPORT

M.R. GOOD, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235

To provide acquisition engineering and systems engineering support to major commands for biomedical systems developed by USAFSAM and accepted for operational use, provide engineering support to the bare base SPO on the Modular Air Transportable Hospital, provide biomedical engineering support to the automated AFEES program, prepare instructions and maintenance information for equipment users, and prepare technical reports to document other completed R & D efforts.

Develop acquisition requirements documentation, monitor systems acquisition, provide operation and maintenance procedures for systems users, assist in identifying and eliminating operational deficiencies, and prepare required USAFSAM technical reports upon completion of developmental efforts.

Supporting agency address information: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0005, PHYSIOLOGIC CRITERIA FOR OXYGEN SYSTEM/EQUIPMENT DESIGN

P.H. ZALESKY, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235

Objective physiologic criteria for future USAF oxygen delivery systems need to be established to ensure more efficient utilization of on-board oxygen supplies and enhanced safety for users. Associated implications for hardware reconfiguration and modified user procedures will be noted. The contents of applicable military specifications, standards, and design handbooks relating to oxygen delivery will be reviewed, evaluated and updated in the light of objective physiologic criteria and hardware performance findings. These efforts are conducted in support of ASD/SML, ASD/ENCCE, AFFDL, and Oklahoma City ALC, and coordinated by appropriate agreements with those organizations.

A dynamic evaluation of current inventory regulators, utilizing the regulator test stand and attached breathing simulator, will provide quantitative performance data for devices currently in use. In particular, added oxygen as a function of cabin altitude and breathing depth/rate will be determined. A human respiratory / metabolism simulator will be programmed with data acquired from in-flight operations to provide an accurate simulator interface for oxygen mask and regulator equipment. This arrangement will provide more detailed data concerning actual in-flight performance of current inventory delivery equipment, emphasizing the degree of compatibility with crewmembers during various stress profiles. Guidelines for minimum oxygen delivery and cabin altitude will be reassessed after evaluating the physiologic effects of prolonged low grade hypoxia and associated performance decrements. Furthermore, alternate methods of oxygen delivery will be investigated with a view toward reducing consumption of oxygen supplies while maintaining physiologic adequacy.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, MEASUREMENT OF FORBIDDEN TRANSITION PROBABILITIES IN HIGHLY IONIZED SPECIES

R.D. BENGTSON, Univ. of Texas, School of Arts, *Austin, Texas* 78712

We are studying the non-equilibrium population of the upper state of hydrogen atoms in a low temperature, (Te approximately 1.5 eV) low density (Ne approximately 10 14 cm-3) plasma. Experimental observations have noted an over-population of the excited levels of factors of 2 - 5.

The high temperature (Te approximately 10 KeV) plasma produced in the Texas Turbulent Torus is being used to measure ionization and excitation rates of oxygen, nitrogen and carbon. We observe the transient line emission of ionized species and obtain cross sections or reaction rates by using a computer code to fit experimental data.

Data reduction for transition probabilities of Bromine and Silicon is underway. Final results are expected within a year.

SUPPORTED BY Robert A. Welch Found. - Houston, Texas

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, FIRE RESEARCH INFORMATION AND LIBRARY

R.G. KATZ, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234

The Fire Research Information and Library Project provides the NBS Fire Program with current awareness activities to expose the research staff to news items, journal articles, conference announcements, and presentations by outside authorities; and with retrospective searches of technical literature. The Project operates one of the few libraries with holdings devoted exclusively to this special field of fire research. In addition, work on processing of space-related fire technology is performed under a contract with NASA.

Objective: The long-range goal is to provide a central document repository and technical information services to the fire research staff.

Motivation: The project supports all fire R&D efforts by providing current awareness, retrospective literature searching, bibliographic compilation, and information and publications dissemination services. Under a contract to NASA, the project prepares selected documents for input to the Fire Safety Data Bank of the Aerospace Research and Data Institute, and thus aids the U.S. space exploration program. The work under the contract is directly relevant to, and assists in, providing technical information services to the NBS Fire Program.

Approach: Technical literature, product specifications, economic data, and audiovisual materials pertaining to fire research, technology, and safety are selected, obtained, cataloged, indexed, and stored for easy retrieval. The state-of-the-art of flame retardance of materials and other subjects is surveyed through literature and patent searches, and attendance at meetings. Literature of interest is announced to the research staff, and circulated upon request. Bibliographies and reports on topics of special interest are prepared and disseminated to the fire community. Material prepared for NASA is processed in the same manner but in greater depth, and it is also abstracted, reviewed for technical accuracy, and edited by the Library and research

staff. Bimonthly seminars on technical topics, given by outside authorities, are held.

Progress: Over 1,700 documents were added to the Library collection in FY 1974, which compared favorably with a planned 1,500 documents. One thousand documents were selected and processed for NASA in accordance with the contract. Seven hundred early Library documents were indexed and are ready for keying. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, ANGULAR SIZES OF COSMIC X-RAY SOURCES USING A BALLOON-BORNE MODULATING COLLIMATOR
L.E. PETERSON, Univ. of California, Graduate School, *San Diego, California* 92038

The cooperating scientists are measuring the angular structure and size of strong cosmic X-ray sources, including the Crab Nebula, to 0.1 arc in the 20-60 KeV region. These data will complement rocket observations in the 2-6 KeV range, and in the case of the Crab Nebula, provide information on the mean free path and lifetime of electrons emitted from the central pulsar NPO532. This information at various energies is needed to understand diffusion, scattering and acceleration processes occuring in the magnetic field structure of the Nebula, and the distribution of hot gases in thermal sources.

SUPPORTED BY U.S. Natl. Science Foundation

10.0002, A SEARCH FOR BORON IN AP STARS
A.M. BOESGAARD, Univ. of Hawaii, School of Arts, *Honolulu, Hawaii* 96822 (NSG 5027)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0003, QUASI RAY ELECTRONS EXPERIMENT FOR ISEE-C HELIOCENTRIC
UNKNOWN, Univ. of Chicago, Graduate School, *Chicago, Illinois* 60637 (NAS 5-20674)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0004, SOLAR ATMOSPHERIC DYNAMICS
R. STEIN, Brandeis University, School of Arts, *Waltham, Massachusetts* 02154 (F19628-75-C-0013)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate solar disturbance predictions. Research - optical studies of solar activity. How research contributes - provide data on the driving of the solar atmospheric oscillation and heating of the chromosphere and corona. Approach - the researcher proposes to calculate the driving of the solar atmospheric oscillation by thermal overstability of acoustic and magnetic modes in the super-adiabatic convection zone and the propagation, refraction and dissipation of these oscillations in the chromosphere and corona. This work directly supports the solar energy transport effort under Work Unit 76490605.

Supporting agency address information: AF Cambridge Research Laboratories LM, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0005, EXTENSIVE COSMIC RAY AIR SHOWERS
J. LINSLEY, Univ. of New Mexico, School of Arts, *Albuquerque, New Mexico* 87106

This program is a study of the phenomenon of extensive cosmic ray air showers and is being conducted at the Volcano Ranch site in New Mexico. The effort to be supported during the next year is comprehensive and includes the following parts. a. Collaborative experiments on various aspects of air showers with groups from Leeds and Durham, England and possibly the University of Utah. These coincidence experiments would utilize the apparatus presently at Volcano Ranch as well as equipment brought by the other groups. b. Further analysis of existing data on the questions of the average lateral structure and the fluctuations in lateral structure of air showers will be performed. c. Theoretical studies and model calculations of the relation between shower observables and more fundamental quantities such as elementary cross sections, inelasticities, and multiplicities will be conducted. d. Efforts will be made to upgrade existing equipment and to automate more of the data acquisition system.

This work is a continuation of that currently supported by Foundation grant number GP-36521, amendment number one.

SUPPORTED BY U.S. Natl. Science Foundation

10.0006, STUDY OF SOLAR-TERRESTRIAL RELATIONSHIPS
S.A. KORFF, New York University, School of Engineering, *New York, New York* 10453

For some time, this group has been studying the variations in the neutrons produced in the earth's atmosphere by the cosmic radiation. This work has involved both experimental work in measuring the neutrons, at various altitudes and latitudes, and also an extensive analysis of the causes of the variations involving a correlation with various aspects of solar activity. This grant supports the analysis of interesting new phenomena discovered in the course of previous work.

SUPPORTED BY U.S. Natl. Science Foundation

10.0007, MAGNETO HYDRODYNAMICS RESEARCH
J.H. THOMAS, Univ. of Rochester, Graduate School, *Rochester, New York* 14627 (F19628-75-C-0011)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate solar disturbance predictions. Research - perform studies on the structure and dynamics of solar penumbral regions. Approach - the approach is the application of theoretical magnetohydrodynamics to explain the observed motions in and configuration of sunspot penumbrae. This work will provide a greater insight toward understanding the physics of punumbrae and their impact on the adjacent solar flare producing plage regions.

Supporting agency address information: AF Cambridge Research Laboratories LM, L G Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0008, THEORETICAL STUDY OF THE INTERACTION OF THE SOLAR WIND WITH PLANETARY ATMOSPHERES
F.C. MICHEL, Rice University, Graduate School, *Houston, Texas* 77001

Theoretical research on the interaction of the magnetized solar wind plasma with planetary atmospheres will be carried out. Planetary observations by unmanned probes have shown distinct differences in the ionospheric structures of Mars and Venus compared to the earth, and evidence obtained to date indicates that neither of these planets possess large intrinsic magnetic fields. It is therefore likely that the electrical conductivity of these planetary atmospheres controls or at least affects the nature of the solar wind interaction, and that the details of this interaction must be delineated in order to understand the structure and ion composition of these planetary atmospheres. Such processes may also affect the evolution of the planetary atmospheres over geologic times by slight mass accretion or losses via the solar wind. Knowledge of the details of ion transport by electro-dynamical processes is also vital to an understanding of measurements made from close planetary orbits of ion composition, distribution, energy spectra, and electric and magnetic fields. Since planetary probes now being planned and built can be expected to obtain such information within the next five years, the main goal of the research proposed herein will be to extend and refine our previous understanding of the solar wind interaction to obtain quantitative estimates of measurable parameters (ion altitude profiles

according to composition and energy, electric and magnetic vector field altitude profiles, ion wake distribution, etc.) in the planetary ionospheres and near vicinity.

SUPPORTED BY U.S. Natl. Science Foundation

GENERAL

11.0001. OPERATION OF A REGIONAL DISSEMINATION CENTER

H. SHRINER, Indiana University, Graduate School, *Bloomington, Indiana* 47401 (NASW 2714)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

No abstracts in this category.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N75-17293*# Aerophysics Research Corp., Hampton, Va.
ODIN: OPTIMAL DESIGN INTEGRATION SYSTEM Final Report
C. R. Glatt and D. S. Hague Washington NASA Feb. 1975 95 p refs
(Contract NAS1-12008)
(NASA-CR-2492) Avail: NTIS HC $4.75 CSCL 01B

The report provides a summary of the Optimal Design Integration (ODIN) System as it exists at Langley Research Center. A discussion of the ODIN System, the executive program and the data base concepts are presented. Two examples illustrate the capabilities of the system which have been exploited. Appended to the report are a summary of abstracts for the ODIN library programs and a description of the use of the executive program in linking the library programs. Author

N75-17294*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WIND TUNNEL INVESTIGATION OF AERODYNAMIC LOADS ON A LARGE-SCALE EXTERNALLY BLOWN FLAP MODEL AND COMPARISON WITH THEORY
Boyd Perry, III and George C. Greene Washington Mar. 1975 99 p refs
(NASA-TN-D-7863; L-9854) Avail: NTIS HC $4.75 CSCL 01A

Results from a wind-tunnel investigation of a large-scale externally blown flap model are presented. The model was equipped with four turbofan engines, a triple-slotted flap system, and a T-tail. The wing had a quarter-chord sweep of 25 deg, an aspect ratio of 7.28, and a taper ratio of 0.4. Aerodynamic loads and load distributions were determined from a total of 564 static pressure orifices located on the upper and lower surfaces of the slat, wing, and flaps. Loads are presented for variations of angle of attack, engine thrust setting, and flap deflection angle. In addition, the experimental results are compared with analytical results calculated by using a potential flow analysis. Author

N75-17295*# Honeywell, Inc., Hopkins, Minn. Government and Aeronautical Products Div.
ANALYSIS AND PRELIMINARY DESIGN OF AN ADVANCED TECHNOLOGY TRANSPORT FLIGHT CONTROL SYSTEM Final Report
Ronald Frazzini and Darrel Vaughn Washington NASA Mar. 1975 424 p refs
(Contract NAS1-12437)
(NASA-CR-2490) Avail: NTIS HC $10.50 CSCL 01C

The analysis and preliminary design of an advanced technology transport aircraft flight control system using avionics and flight control concepts appropriate to the 1980-1985 time period are discussed. Specifically, the techniques and requirements of the flight control system were established, a number of candidate configurations were defined, and an evaluation of these configurations was performed to establish a recommended approach. Candidate configurations based on redundant integration of various sensor types, computational methods, servo actuator arrangements and data-transfer techniques were defined to the functional module and piece-part level. Life-cycle costs, for the flight control configurations, as determined in an operational environment model for 200 aircraft over a 15-year service life, were the basis of the optimum configuration selection tradeoff. The recommended system concept is a quad digital computer configuration utilizing a small microprocessor for input/output control, a hexad skewed set of conventional sensors for body rate and body acceleration, and triple integrated actuators. Author

N75-17296*# California Inst. of Tech., Pasadena. Graduate Aeronautical Lab.
THEORETICAL AND EXPERIMENTAL STUDY ON THE EJECTOR AUGMENTED JET FLAP Final Report
H. J. Stewart 1 Aug. 1974 171 p refs
(Grant NGR-05-002-239)
(NASA-CR-136749) Avail: NTIS HC $6.25 CSCL 01B

The analytical concept used in determining the characteristics of jet flap or related propulsive systems suitable for VTOL and STOL applications was examined. The configuration chosen was a two dimensional wing with a biplane flap, having a jet injected on the upper surface of the wing at the flap hinge axis and discharging into the channel between the two elements of the flap. The experimental work was conducted in a two dimensional test installation in a subsonic wind tunnel. The model description, the test conditions, and a summary of the experimental results are presented. Author

N75-17297# European Space Research Organization, Paris (France).
A SPATIAL THEORY FOR THE GROUND RESONANCE OF HELICOPTERS
Rolf Schroeder Nov. 1974 181 p refs Transl. into ENGLISH of Eine Raeumliche Theorie fuer die Bodenresonanz von Hubschraubern, DLR-FB-73-84, DFVLR, 22 Jun. 1973
(ESRO-TT-108; DLR-FB-73-84) Avail: NTIS HC $7.00; DFVLR, Porz, West Ger. 30 DM

The vibration phenomena occurring during takeoff and landing of a helicopter were experimentally and theoretically investigated. The investigation covers vibrations of simplified two- and

three-dimensional rotor systems. In the mathematical treatment additional degrees of fuselage freedom were taken into account. The existence of as yet unknown instability regions is pointed out with this extended theory. ESRO

N75-17298# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Flugtechnik.

WIND TUNNEL INVESTIGATIONS ON AN AIRPLANE MODEL WITH VARIABLE SWEEPBACK IN THE INCOMPRESSIBLE REGION. PART 1: COMPARISON OF THE MOST IMPORTANT EXPERIMENTAL PARAMETERS AND THEIR INFLUENCE ON THE AERODYNAMIC COEFFICIENTS [WINDKANLUNTERSUCHUNGEN AN EINEM FLUGZEUGMODELL MIT VARIABLER PFEILUNG IM INKOMPRESSIBLEN BEREICH. TEIL 1: VERGLEICHENDE ZUSAMMENSTELLUNG DER WICHTIGSTEN PARAMETER DER UNTERSUCHUNGSREIHE UND IHRE EINFLUESSE AUF DIE AERODYNAMISCHEN BEIWERTE]

Dieter Schmitt 7 Aug. 1973 146 p refs In GERMAN Sponsored by Deut. Forschungsgemeinschaft
(IFD-4/73-Pt-1) Avail: NTIS HC $5.75

The influence of variation of wing sweepback, pivot position, horizontal tail surface, angle of attack of the horizontal tail surface, body strake, and sideslip angle on the stationary aerodynamic coefficients of the lateral and longitudinal movement of an aircraft model with variable sweepback was investigated. Photographs of the flow distribution in various planes above the wing were made. The measured neutral point variations of the body-wing configuration as a function of the sweep angle were compared with theoretical calculations. ESRO

N75-17299# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.

TRANSONIC WIND TUNNEL TESTS ON TWO-DIMENSIONAL AEROFOIL SECTIONS PART 1: DETERMINATION OF PRESSURE DISTRIBUTION AND DRAG FOR AN AEROFOIL OF TYPE NLR 13 IN FFA WIND TUNNEL S5

Goeran Ehn Sep. 1974 281 p refs
(Contract F-INK-81133-71-302(21898))
(FFA-TN-AU-725-Pt-1) Avail: NTIS HC $8.75

Wind tunnel tests of a two dimensional airfoil designed for zero lift and supercritical pressure distribution were conducted. Experimental verification of shock-free transonic flow around these quasi-elliptic airfoil sections was obtained. The investigation included airfoil pressure distribution measurements and drag measurements in the Mach number range from 0.5 to 0.85 and for angles of attack from minus 4 degrees to plus 4 degrees. It was determined that at near design conditions the maximum suction on the airfoil was below the predicted value. Variations in drag coefficients were also determined and the causes for the variations are analyzed. Author (ESRO)

N75-17300# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.

TRANSONIC WIND TUNNEL TESTS OF THE PT3 MODEL, A SUPERCRITICAL WING ON A SIMPLE BODY. PART 1: SUMMARY AND COMPARISON WITH EARLIER RESULTS

Anders L. Gustavsson and Roine Mattsson Aug. 1974 35 p refs
(Contract FMV-F-INK-82223-73-009-07-001)
(FFA-TN-AU-1134-Pt-1) Avail: NTIS HC $3.75

A supercritical airfoil was applied in a design of a wind tunnel model with a moderate aspect ratio wing. A summary is given of the design objectives and the test results. Comparisons are made with results obtained earlier for a reference configuration consisting of a wing with a standard-type airfoil and with two different bodies, one cylindrical and one waisted. The results show that an increase in drag rise Mach number is obtained with both the supercritical wing and with the waisted body. For this moderate aspect ratio wing the improvement in drag rise Mach number which is obtained by the application of the supercritical airfoil is much smaller than the comparative two-dimensional improvements. The shock formation is very similar to shock formations for a conventional airfoil wing. To delay this shock formation a combination of supercritical airfoil and body waisting should be used. Author (ESRO)

N75-17301# Royal Aircraft Establishment, Farnborough (England). Structures Dept.

THE DEVELOPMENT OF RAPID-TESTING TECHNIQUES FOR FLUTTER EXPERIMENTS

K. W. Newman, C. W. Skingle, and D. R. Gaukroger London Aeron. Res. Council 1974 38 p refs Supersedes RAE-TR-73067; ARC-34531
(ARC-CP-1274; RAE-TR-73067; ARC-34531) Avail: NTIS HC $3.75; HMSO 65p; PHI $2.75

A research program was undertaken to develop flutter test techniques combining short duration tests with acceptable accuracy by applying digital analysis techniques. An electrical analog representing the equations of antisymmetric motion of a high speed, T-tail, flutter model, previously wind tunnel tested, was developed. Appropriate excitation and response analysis was applied in order to determine the subcritical excitation response behavior. The results show that where the level of background noise excitation is low, the impulse response of the system enables modal characteristics to be determined with accuracies comparable to those obtained from conventional steady state tests. With higher levels of background noise, a sweep frequency input gives optimum results. Author (ESRO)

N75-17302# Royal Aircraft Establishment, Teddington (England). Aerodynamics Dept.

COMPARISON BETWEEN DYNAMIC STABILITY BOUNDARIES FOR NPL 9615 AND NACA 0012 AEROFOILS PITCHING ABOUT THE QUARTER-CHORD

A. W. Moore, N. C. Lambourne, and L. Woodgate London Aeron. Res. Council 1974 53 p refs Supersedes RAE-TR-71163; ARC-33252
(ARC-CP-1279; RAE-TR-71163; ARC-33252) Avail: NTIS HC $4.25; HMSO 85 p; PHI $3.65

The results are presented of stall flutter tests on two airfoils one with NACA 0012 section and the other with NPL 9615 section. A free-oscillation technique is used, each model having a single degree of freedom, namely pure pitching about a quarter-chord axis. Conditions giving zero aerodynamic damping are found for a range of frequency, Mach number, mean incidence and amplitude of oscillation appropriate to a helicopter blade. The results with a smooth leading edge are seen to compare favorably with other tests in which forces were determined by integration of chordwise pressure distributions measured near the center line of a similar airfoil. The main conclusion from these tests, reached after a consideration of the relative positions of the boundaries for negative aerodynamic damping and for maximum lift, is that the improvements that the NPL 9615 section offers in maximum lift can be used with no greater likelihood of stall flutter occurring with this section than with the NACA 0012 section. A futher important conclusion relates to the condition of the leading edge. When a roughness strip of carborundum particles is added at the leading edge of each airfoil, instability is encountered at a lower mean incidence than with a smooth surface. Author (ESRO)

N75-17303# Technical Univ. of Denmark, Lyngby.

APPLICATION OF A VARIATIONAL METHOD IN PLANE COMPRESSIBLE FLOW CALCULATION

H. Rasmussen and N. Heys London Aeron. Res. Council 1974 28 p refs Supersedes RAE-TR-72230; ARC-34605 Sponsored by Sci. Res. Council Prepared jointly with Southampton Univ.
(ARC-CP-1284; RAE-TR-72230; ARC-34605) Avail: NTIS HC $3.75; HMSO 50 p; PHI $2.25

The classical problem of steady inviscid plane subsonic flow past an airfoil is formulated as a variational principle, the Bateman-Dirichlet principle. A finite difference method was used to calculate approximations to the extremals for flow past ellipses and Karman-Trefftz profiles of different thickness ratios. The solutions obtained for the ellipses were compared with other approximate solutions except near the stagnation points where differences of up to 5% are encountered. Author (ESRO)

N75-17304# Royal Aircraft Establishment, Farnborough (England). Structures Dept.

AN AEROELASTIC MODEL HELICOPTER ROTOR

R. Cansdale London Aeron. Res. Council 1974 30 p refs Supersedes RAE-TR-73042; ARC-34836
(ARC-CP-1288; RAE-TR-73042; ARC-34836) Avail: NTIS

HC $3.75; HMSO 55p; PHI $2.35

The design, construction, and testing of a 1/5 scale model of a non-articulated helicopter main rotor are discussed. The scaling was such as to ensure correct Froude number representation. The measured flap and lag stiffnesses of the model were close to the scaled values, although the frequencies of the fundamental flap and lag modes were lower than the design figure. The higher mode frequencies, however, agreed well with the scaled values. Author (ESRO)

N75-17305# Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.

MEASUREMENT OF THE INTERNAL PERFORMANCE OF A RECTANGULAR AIR INTAKE MOUNTED ON A FUSELAGE AT MACH NUMBERS FROM 1.6 TO 2, PART 4

C.S. Brown and E. L. Goldsmith London Aeron. Res. Council 1974 70 p refs Supersedes RAE-TR-72136; ARC-34333 (ARC-CP-1291; RAE-TR-72136; ARC-34333) Avail: NTIS HC $4.25; HMSO £1; PHI $3.90

A rectangular variable geometry intake, whose internal performance in a uniform flow field had previously been measured, was tested on a fuselage with its leading edge both horizontal and vertical. In the case of the vertical intake, the effect of removing the lower swept endwall was investigated. The tests were done in a range of Mach number from 1.61 to 2.01 at incidences from 0 deg to 12 deg. The Reynolds number based on intake entry height was approximately 0.7 x 10 to the sixth power. This particular fuselage appears to impose only a small effect on the intake performance when the intake is horizontal. However a survey of the fuselage flow field indicates the complexity of the flow entering the intake and emphasizes the difficulty in using average flow properties to establish very accurate estimates of mass flow. The vertical intake suffers considerable loss of performance both in terms of maximum mass flow and critical point pressure recovery at incidences above about 4 deg when fitted with swept endwalls. By removing the lower swept endwall, the zero incidence performance can be maintained up to incidences of 12 deg. Author (ESRO)

N75-17306# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.

LOW-SPEED WIND-TUNNEL TESTS ON THE LIFT-DEPENDENT DRAG OF DELTA WINGS WITH CONICAL CAMBER

D. L. I. Kirkpatrick and P. J. Butterworth London Aeron. Res. Council 1974 39 p refs Supersedes RAE-TR-72123; ARC-34085 (ARC-CP-1293; RAE-TR-72123; ARC-34085) Avail: NTIS HC $3.75; HMSO 70p; PHI $2.95

A theoretical method of designing cambered slender wings to have low lift-dependent drag is described. The results of subsonic wind tunnel tests on a series of thin cambered delta wings of aspect ratio 2 are presented, and the significant drag reductions achieved are discussed in relation to theoretical predictions for the drag of cambered slender wings. Author (ESRO)

N75-17307# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.

A PREDICTION METHOD FOR PRESSURE DISTRIBUTIONS ON COMPRESSION SURFACES OF CONICAL BODIES AT SUPERSONIC SPEEDS

M. J. Larcombe London Aeron. Res. Council 1974 28 p refs Supersedes RAE-TM-AERO-1457; ARC-34849 (ARC-CP-1295; RAE-TM-AERO-1457; ARC-34849) Avail: NTIS HC $3.75; HMSO 50p; PHI $2.15

An approximation to the flow on the compression surfaces of delta wings and conical bodies was made by a new simple method. Surface pressure distributions were obtained by an interpolation procedure between circularly conical flow and two dimensional flow. The technique is applicable to a wide variety of body geometries and flow conditions including cases with either attached or detached shock waves at the leading edges. Author (ESRO)

N75-17308# Edinburgh Univ. (Scotland). Dept. of Physics.

NONLINEAR STABILITY THEORY OF THE FLAT PLATE BOUNDARY LAYER

D. Corner, M. D. J. Barry, and M. A. S. Ross London Aeron. Res. Council 1974 29 p refs Supersedes ARC-34273 Sponsored partly by the Sci. Res. Council and the Dept. of Trade and Ind.
(ARC-CP-1296; ARC-34273) Avail: NTIS HC $3.75; HMSO 55p; PHI $2.35

A simultaneous solution of the nonlinear stability equations for the flat plate boundary layer with space amplification was obtained for a single non-dimensional frequency parameter, at a series of Reynolds numbers, and using a limited number of amplitudes of the fundamental perturbation. The distortion of the fundamental by the generation of second harmonic is normally included in the solution, but some results were obtained excluding this effect. The terms representing the growth of boundary layer thickness are included. The results were compared with published work on nonlinear effects in plane Poiseuille flow. Author (ESRO)

N75-17309# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.

ICE SIMULATION: A 2-DIMENSIONAL WIND TUNNEL INVESTIGATION OF A NACA 652A215 WING SECTION WITH SINGLE SLOTTED FLAP. PART 2: CONFIGURATIONS TYPICAL FOR TRANSPORT AIRPLANES

U. Clareus Jun. 1974 32 p refs
(Contract SWEDBTD-73-4722)
(FFA-TN-AU-995-Pt-2) Avail: NTIS HC $3.75

The effect of simulated ice on the aerodynamic characteristics of a two-dimensional wing section with and without a single slotted flap was investigated. Seven different ice configurations for large transport aircraft were tested using three different flap angles. The results show that the maximum lift coefficient is very sensitive to disturbances on the wing leading edge. The loss in C(L max) varies from 10 to 40% for the different configurations tested. The drag coefficient is also adversely affected; in some cases the drag increase amounts to several hundred percent, with a corresponding reduction in the lift over drag ratio. The relatively low importance of geometrical size of the ice formation, once the first leading edge disturbance is formed, was verified. Author (ESRO)

N75-17310# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.

THE VISCOUS FLOW AROUND A TWO DIMENSIONAL HIGH LIFT WING. ANALYSIS OF BOUNDARY LAYER MEASUREMENTS Final Report

A. Bertelrud and B. L. G. Ljungstroem Oct. 1974 113 p refs
(Contract SWEDBTD-73-4381)
(FFA-TN-AU-1155) Avail: NTIS HC $5.25

The shear layer data for a 2D high lift model is presented in terms of boundary layer integral properties and wake parameters. The high lift model had two basic configurations: small or large slat gap corresponding to different extents of mixing. Slat and wing suction was used to alter the conditions for viscous interaction. Data in the form of tabulated velocity profiles, and data for 56 free wakes obtained in the high pressure gradient flow are presented. Some simple comparisons with theory were made. Development of a complete calculation method is considered to be outside the scope of the present study. Author (ESRO)

N75-17311# National Aerospace Lab., Amsterdam (Netherlands).

A POTENTIAL FLOW MODEL FOR THE FLOW FIELD INDUCED BY A JET EXHAUSTING INTO A UNIFORM CROSS FLOW

H. Snel 27 Apr. 1973 90 p refs Sponsored by the Neth. Agency for Aerospace Programs
(NLR-TR-73048-U) Avail: NTIS HC $4.75

A method is presented for the calculation of the flow field induced by a turbulent jet exhausting into a uniform cross flow. Outside the jet boundary, potential flow was assumed. The jet effects were represented by a source distribution on the jet boundary. The boundary conditions on the jet boundary (normal velocity) were calculated from a set of quadratic equations, representing the transfer of momentum from the cross flow to the jet. The resulting Newmann problem for the potential flow field was solved by the panel method. Comparison of theoretical with measured values of the pressure coefficients on a flat plate,

from which the jet is blown, shows only qualitative agreement. This is attributed to the behavior of the boundary layer on the plate, interacting with the jet. Author (ESRO)

N75-17312# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services Div.
PROGRAM FOR THE COMPUTATION OF AXISYMMETRIC SUPERSONIC FLOW AROUND LAUNCH TYPE VEHICLES BASED ON THE METHOD OF CHARACTERISTICS
J. P. F. Lindhout and C. R. Traas 20 May 1973 78 p refs
(NLR-TR-73093-U) Avail: NTIS HC $4.75

A program in ALGOL is described for the computation of the supersonic flow of thermally and calorically perfect gas around axisymmetric bodies. Computational details are given and some numerical results are presented. Emphasis is placed on the organization of the program. For a specific case the calculated results are compared with pressure measurements on the body and with schlieren photographs. Author (ESRO)

N75-17313# Army Foreign Science and Technology Center, Charlottesville, Va.
A LIMITING CASE OF MULTIPHASE FLOW PAST SLENDER BODIES
Kh. Rakhmatulin and S. I. Meliyudov 27 Aug. 1974 10 p refs Transl. into ENGLISH from Akad. Nauk Uzbekskoi SSR, Tashkent. Izv. Seriya Tekhn. Nauk (USSR), v. 16, no. 6, 1972 p 31-35
(AD-A000240; FSTC-HT-23-369-74) Avail: NTIS CSCL 01/1

The article considers a uniform gas flow containing fine particles of solid material which impinges on a thin symmetrical airfoil. It is shown that to solve the problem of multivelocity flow past slender bodies a relation for the pressure as a function of the mean mixture density derived for single-velocity motion may be employed. GRA

N75-17314# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
STALL FLUTTER AND NONLINEAR DIVERGENCE OF A TWO-DIMENSIONAL FLAT PLATE WING Final Report
John Dugundji and Krishnaswamy Aravamudan Jul. 1974 67 p refs
(Contract F44620-69-C-0091)
(AD-A000569; ASRL-TR-159-6; AFOSR-74-1734TR) Avail: NTIS CSCL 20/4

An experimental investigation is made of the stall flutter and nonlinear divergence characteristics of a two-dimensional flat-plate wing, pivoted about the mid-chord. The only nonlinearity present was aerodynamic. Measurements were taken of static moments, flutter amplitudes, centershifts, frequencies, and decay-growth rates for various initial angle-of-attack settings, and compared with linear theory and quasistatic theory. Nonlinear divergence was also observed and resulting static equilibrium positions were obtained. Free rotation tests of the wing were also conducted. (Modified author abstract) GRA

N75-17315# DCW Industries, Sherman Oaks, Calif.
TURBULENCE-MODEL TRANSITION PREDICTIONS FOR BLUNT-BODY FLOWS Interim Report
David C. Wilcox Jul. 1974 60 p refs
(Contract F44620-74-C-0048; AF Proj. 9781)
(AD-A000575; DCW-R-03-01; AFOSR-74-1714TR) Avail: NTIS CSCL 20/4

An accurate and efficient method has been developed for predicting transition from laminar to turbulent flow, based upon a phenomenological model originally devised for fully turbulent flows. The model is modified to account for low Reynolds number phenomena and is used to make a priori transition predictions. Primary emphasis focuses upon blunt-body flows; predictions are also made for constant-pressure boundary-layer flows to provide as broad a data base as possible to assess model accuracy. (Modified author abstract) GRA

N75-17316# Avir Associates, Inc., Baltimore, Md.
SABOT AERODYNAMICS DURING DISCARD Final Report
Ivan Stern Oct. 1974 64 p refs
(Contract DAAD05-73-C-0173; DA Proj. 1T0-61102-A-14B)
(AD-A000899; BRL-CR-181) Avail: NTIS CSCL 19/1

The aerodynamics of a generic sabot piece is treated using the Newtonian approximation. The sabot piece is composed of an inner and outer cylindrical surface, conical surfaces on either end, and longitudinal slices parallel to the axis. When assembled, an integral number of such similar pieces form an annular cylinder. A computer program is included which gives the Newtonian lift, drag, and moment coefficients of the piece in terms of the front and rear cone angles, length, ratio of inner to outer radii, and number of pieces. Only pitching motion is treated, and no aerodynamic interference between sabot pieces or projectile is considered. A discussion of a model for sabot discard is given. GRA

N75-17317# General Electric Co., Philadelphia, Pa. Reentry and Environmental Systems Div.
SERVANT PROGRAM Final Technical Report, Jun. 1973 - Nov. 1974
R. J. Berman Nov. 1974 434 p refs
(Contract F04701-63-C-0311)
(AD-A001011; SAMSO-TR-74-230) Avail: NTIS CSCL 16/2

The purpose of the SERVANT program is to show aerothermodynamic feasibility of the concept. This has been done through the use of analytical calculations together with results of wind tunnel tests to determine: the test model flow field uniformity as affected by the parent nose tip geometry, vehicle freestream conditions, and angle of attack; the interaction heating effects on the submodel and support structure; aerodynamic stability as affected by both parent and submodel ablated shapes and freestream conditions; and provide flight dynamic performance for the SERVANT configuration including angle of attack envelopes, the effects of test model asymmetries on SERVANT roll behavior and the effects of test nose tip failures. GRA

N75-17318# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
LOW SPEED WIND TUNNEL TEST OF JET FLAPS AND FLOATING WINGTIP AILERONS ON A FIGHTER WING Final Report
John A. Eney and Samuel Greenhaigh 17 Oct. 1974 25 p refs
(ZR00001)
(AD-A000809; NADC-74198-30) Avail: NTIS CSCL 20/4

An 18% scale semispan fighter wing was tested at low speed in various configurations to assess improvements in lift and roll control. A full span jet flap achieved a CL 14% higher than current aircraft. Floating wingtip ailerons provided undiminished roll control up through high angles of attack. Parameters measured were angle of attack, lift coefficient, drag coefficient, pitching moment, rolling moment, and yawing moment. GRA

N75-17319# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
TURBULENT WAKE BEHIND SLENDER BODIES INCLUDING SELF-PROPELLED CONFIGURATIONS Final Report
R. C. Swanson, Jr., J. A. Schetz, and A. K. Jakubowski Sep. 1974 113 p refs
(Contract N00014-72-A-0136-0004; NR Proj. 062-481)
(AD-A001040; VPI-Aero-024) Avail: NTIS CSCL 20/4

The turbulent wakes behind a streamlined drag body, a jet-propelled body, and a propeller-driven body are studied experimentally in a subsonic wind tunnel at a principal nominal free-stream velocity of 206 ft/sec. Mean flow data taken downstream of the sterns of these bodies include velocity and static pressure distributions. The stream-wise variation of the maximum values of axial turbulence intensity and radial shear stress are also presented. The mean flow data for the wake behind the drag body compare favorably with previous experiments and establish a rigid reference for the wakes behind slender, self-propelled configurations. The downstream rate of decay is essentially the same for the drag and propeller-driven bodies, whereas the decay for the jet-propelled body is substantially faster. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N75-17320# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
THE CIVIL AIRCRAFT AIRWORTHINESS DATA RECORDING PROGRAMME. A STUDY OF NORMAL OPERATIONAL LANDING PERFORMANCE ON SUBSONIC CIVIL JET AIRCRAFT
G. B. Hutton London Aeron. Res. Council 1974 56 p refs Supersedes RAE-TR-72097; ARC-34303; CAADRP-TR-26
(ARC-CP-1273; RAE-TR-72097; ARC-34303; CAADRP-TR-26) Avail: NTIS HC $4.25; HMSO 95p; PHI $3.90

A statistical study was conducted of a number of performance and flying control parameters on two aircraft types during final approach and landing. Approximately 200 landings from each of two periods with a gap of one year were studied on both aircraft types and the results show the probability of meeting or exceeding various values of each parameter together with mean values and standard deviations. Author (ESRO)

N75-17321# Air Force Weapons Lab., Kirtland AFB, N.Mex.
FREQUENCY RESPONSE MEASUREMENTS FOR CASSETTE TAPE PLAYERS Final Report, 5 Jun. 1973 - 30 Jun. 1974
A. Lawrence Kolz and Richard E. Johnson Oct. 1974 52 p
(AD-A000420; AFWL-TR-74-147) Avail: NTIS CSCL 01/2

Automotive cassette tape players made by 21 companies were surveyed to determine a prototype unit that may be used as part of a mobile bird dispersal system to help reduce the USAF bird-strike hazard. Nine units were selected on the basis of the manufacturer's specifications and tested for frequency response. The three with the flattest measured response were then used to record audio sonagrams from taped recordings of four bird distress calls. These tests indicated that, of the nine players, the three exhibiting the flattest frequency response were the Hitachi Model CS-200, Pioneer Model KP-300, and Realistic catalog no. 12-1823. Author (GRA)

N75-17322# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
AIRCRAFT ACCIDENT REPORTS. BRIEF FORMAT SUPPLEMENTAL ISSUE, 1973 ACCIDENTS. FILE NUMBERS 1-0040 THRU 1-0042, 3-4141 THRU 3-4163, 4-0001 THRU 4-0032, 5-0001 THRU 5-0035, 6-0001 THRU 6-0086, A-0001 THRU A-0003, A-0005, C-0001, E-0001 THRU E-0023
16 Sep. 1974 101 p
(PB-237091/4; NTSB-BA-74-5) Avail: NTIS HC $5.25 CSCL 01B

Reports of aircraft accidents and incidents that occurred in 1973 are presented. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N75-17323# Federal Aviation Agency, Atlantic City, N.J.
MODELING AIR TRAFFIC PERFORMANCE MEASURES. VOLUME 2: INITIAL DATA ANALYSIS AND SIMULATIONS Interim Report, Jul. 1972 - Aug. 1973
J. S. Hunter, D. E. Blumenfeld, and D.-A. Hsu Jul. 1974 484 p refs
(Contract DOT FA72WA-741)
(AD-782739; FAA-NA-73-Vol-2-104; FAA-RD-73-147-Vol-2) Avail: NTIS HC $9.75

The statistical characteristics of voice communications data recorded over a busy two-hour period covering the 101 sectors of the New York air traffic control center (ARTCC) are examined. This study is the first stage of a larger effort to construct a simulation model descriptive of the aircraft flow and communication performance surrounding a major airport. The structure of communications transactions, transmissions, and message elements are analyzed, and the frequencies and durations of these components are described by statistical models. Channel utilization is defined and empirical equations identifying sector structure variables of greatest influence are constructed and compared. Models for aircraft arrivals, departures, and time in sector are postulated, and the assumptions underlying these models tested against the data. A preliminary simulation model for a single sector is described and exercised. Author

N75-17324# National Aviation Facilities Experimental Center, Atlantic City, N.J.
DISTANCE MEASURING EQUIPMENT TRAFFIC-LOADING CAPACITY INVESTIGATION Final Report, Jul. - Oct. 1973
Harold Postel Jun. 1974 96 p
(AD-780959; FAA-RD-74-93; FAA-NA-73-105) Avail: NTIS HC $4.00

Findings of the distance measuring equipment (DME) traffic counts from selected facilities are presented. The data provide a basis for estimating present and future DME traffic-handling capabilities. DME traffic counts were conducted at the following facilities: Miami, Florida; Atlanta, Georgia; Robbinsville, New Jersey; Gardner, Massachusetts; Long Beach, California; Los Angeles, California; Oakland, California; Nottingham, Maryland; and Modena, Pennsylvania. The Miami, Florida, VORTAC showed the greatest amount of DME traffic, approaching 56 percent of capacity during peak periods. Author

N75-17325# Mitre Corp., McLean, Va.
STUDY OF ALTERNATIVE BEACON BASED SURVEILLANCE AND DATA LINK SYSTEMS, VOLUME 2 Final Report
S. R. Jones, R. C. Gibbons, A. M. Manders, N. A. Spencer, and I. B. Ylvisaker Apr. 1974 400 p refs
(Contract DOT-FA70WA-2448)
(AD-772136; MTR-6517-Vol-2; FAA-EM-74-7-2) Avail: NTIS HC $10.25

Several beacon-based surveillance systems--both addressed and non-addressed--as well as several data link systems, in appropriate combinations, were analyzed with respect to meeting the future requirements of the Upgraded Third Generation ATC System. These requirements included surveillance characteristics suitable for automatic ground-based collision avoidance (IPC); they also included data link characteristics suitable for delivering all ATC and IPC services and estimated company digital communication services. The Discrete Address Beacon System (DABS) is shown to be the lowest cost of all alternatives for implementing IPC for the basic general aviation user. The detailed analytical and engineering design efforts are discussed. Author

N75-17326# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ATC SURVEILLANCE/COMMUNICATION ANALYSIS AND PLANNING Quarterly Technical Summary, 1 Mar. - 31 May 1974
1 Jun. 1974 20 p refs
(Contracts DOT-FA72WAI-242; F19628-73-C-0002)
(AD-783184; FAA-RD-74-105) Avail: NTIS HC $3.00

Under ASR improvement program, several changes to the FPS-18 radar were completed to improve its stability under variable prf conditions. The digital interfaces to the NOVA computer were finalized and put into operation. System tests commenced and demonstrated good aircraft detection when operating on all but the zero-velocity filter. Correction of this problem is under active investigation. NAFEC Support was completed. Precision altitude and landing monitor system tests were conducted. Some initial data were in good agreement with theoretical predictions; some in gross disagreement. Investigation disclosed a problem in two of the five antennas, and this is being corrected. Test results are reported. Author

N75-17327*# Research Triangle Inst., Research Triangle Park, N.C. Engineering Div.
AN INVESTIGATION OF ERRORS AND DATA PROCESSING TECHNIQUES FOR AN RF MULTILATERATION SYSTEM
Charles L. Britt, Jr. Feb. 1975 149 p refs
(Contract NAS1-12910)
(NASA-CR-132609; RTI-43U-954) Avail: NTIS HC $5.75 CSCL 17G

The development of an RF Multilateration system to provide accurate position and velocity measurements during the approach and landing phase of Vertical Takeoff Aircraft operation is discussed. The system uses an angle-modulated ranging signal to provide both range and range rate measurements between an aircraft transponder and multiple ground stations. Range and range rate measurements are converted to coordinate measurements and the coordinate and coordinate rate information is transmitted by an integral data link to the aircraft. Data processing techniques are analyzed to show advantages and disadvantages. Error analyses are provided to permit a comparison of the various techniques. Author

N75-17328*# Honeywell, Inc., Minneapolis, Minn. Government and Aeronautical Products Div.
STRAPDOWN COST TREND STUDY AND FORECAST
A. J. Eberlein and P. G. Savage [1975] 151 p refs
(Contract NAS2-8065)
(NASA-CR-137585) Avail: NTIS HC $6.25 CSCL 17G

The potential cost advantages offered by advanced strapdown inertial technology in future commercial short-haul aircraft are summarized. The initial procurement cost and six year cost-of-ownership, which includes spares and direct maintenance cost were calculated for kinematic and inertial navigation systems such that traditional and strapdown mechanization costs could be compared. Cost results for the inertial navigation systems showed that initial costs and the cost of ownership for traditional triple redundant gimbaled inertial navigators are three times the cost of the equivalent skewed redundant strapdown inertial navigator. The net cost advantage for the strapdown kinematic system is directly attributable to the reduction in sensor count for strapdown. The strapdown kinematic system has the added advantage of providing a fail-operational inertial navigation capability for no additional cost due to the use of inertial grade sensors and attitude reference computers. Author

N75-17329# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ADAPTION PROCESSES IN AIRCRAFT GUIDANCE SYSTEMS
I. S. Ukolov 21 Oct. 1974 30 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Nauchn. Sov. Po Kompleksn. Probl., Inform. Materialy (USSR), v. 6, no. 53, 1972 p 5-19
(AD-A000354; FTD-HC-23-2731-74) Avail: NTIS HC $3.75 CSCL 17/7

The principal feature of self-regulating systems and autopilots consists of the fact that, in estimating and analyzing the dynamic characteristics of the aircraft directly during flight, the system reconstructs the contour parameters for guidance in the direction necessary to provide optimal margins of stability and guidance process quality. Particular attention is paid to the problem of developing and producing self-regulating autopilots. The development of theoretical bases and the modification of new principles and methods of guidance are considered. Author

N75-17330# Army Electronics Command, Fort Monmouth, N.J.
IMPROVED UHF MULTI-ANTENNA SYSTEM FOR AIR TRAFFIC CONTROL CENTRALS Final Report
D. V. Campbell and J. Arnold Oct. 1974 29 p
(DA Proj. 1T1-61102-B-31A)
(AD-A000671; ECOM-4269) Avail: NTIS CSCL 17/7

An improved low-cost dual UHF antenna system for air-traffic control was developed which permits simultaneous transmission and reception with little or no crosstalk. Electrical interaction of the antennas is minimized by mounting them collinearly and by incorporating special transmission line decouplers (isolators) to suppress feedline current. Broadband impedance compensators provide satisfactory impedance matching. The reduction in shadowing leads to improved horizontal plane radiation patterns. Author (GRA)

N75-17331# Aerospace Guidance and Metrology Center, Newark Air Force Station, Ohio.
THREE LIFE CYCLE COST MODELS FOR INERTIAL SYSTEMS Final Report
Robert E. Adel, William J. Bonner, and Keith J. Gibson 4 Apr. 1974 50 p
(AD-A000483; AGMC-74-011-2) Avail: NTIS CSCL 17/7

The purpose of this report was to present three different Life Cycle Cost models for inertial systems to the membership of the Life Cycle Cost Task Group of the Joint Services Data Exchange for Inertial Systems for the purpose of familiarization prior to the April 1974 meeting of that group in Anaheim, California. The report describes three life cycle cost models that have been used in economic analysis of inertial navigation systems. Author (GRA)

N75-17332# Sperry Rand Corp., Great Neck, N.Y. Sperry Gyroscope Div.
LASER GYRO REACTION TIME INVESTIGATION PROGRAM Technical Report, 1 Mar. 1973 - 31 Mar. 1974
Robert F. Morrison Sep. 1974 73 p
(Contract F33615-73-C-1054; AF Proj. 6095)
(AD-A001646; SGD-4284-0754; AFAL-TR-74-189) Avail: NTIS CSCL 17/7

The underlying purpose of the investigation was to evolve a ring laser gyro design suitable for application in unaided aircraft inertial navigation systems. Significant improvement in laser gyro performance capability was the program goal, to be attained by analyzing and modifying parameters affecting gyro drift and reaction time. In addition to the analytical effort, the work scope included fabrication and testing of an experimental ring laser gyro (RLG) of new design. The prime effort was not directed toward developing new concepts but rather toward improving good available designs by choice of materials, circuit modifications, packaging, etc. The goal of instantaneous operation was demonstrated with a random drift of 0.015 degree/hour after less than a half hour of operation. GRA

N75-17333# Analytic Sciences Corp., Reading, Mass.
AN/ASN-90 SYSTEMS IMPROVEMENT PROGRAM Final Report, Oct. 1972 - Jun. 1974
William K. Sharpley and Robert F. Shipp 31 Oct. 1974 84 p
(Contract F33615-73-C-1146; AF Proj. 6095)
(AD-A001647; TASC-353-10; AFAL-TR-74-250) Avail: NTIS CSCL 17/7

Status is reported on the development of tools for the analysis of operational performance and operational maintenance of a complex avionics system, and the cost-of-ownership implications of improvement alternatives. Results of the application of these tools to the AN/ASN-90 Inertial Measurement Set, as used in the A-7D aircraft, are also reported. These results were obtained as part of TASC's continuing participation in the KT-73 Inertial Navigation Systems Technical Interchange Task Group (TITG) chaired by the Air Force Item Manager at the Oklahoma City Air Logistics Center. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-17334# Boeing Co., Wichita, Kans.
FAA JT3D QUIET NACELLE RETROFIT FEASIBILITY PROGRAM. VOLUME 3: LOWER GOAL FLIGHT TESTING, ECONOMIC ANALYSES AND SUMMARY Final Report, Jul. 1971 - Nov. 1973
J. E. Mayer et al Feb. 1974 378 p refs
(Contract DOT-FA71WA-2628)
(AD-787610; D3-9042-4; FAA-RD-73-131-Vol-3) Avail: NTIS HC $10.50

A program to design and flight test quiet nacelles suitable for installation on Boeing 747 aircraft with JT3D turbofan engines was conducted. The purpose of the program was to provide

data to assist in determining whether the current Boeing 707 aircraft fleet can be modified for meaningful noise reductions. The modifications to the nacelles are described. The flight test program is discussed and the performance of the modified nacelle is compared with the baseline configuration. An economic analysis of retrofitting the Boeing 707 aircraft fleet with production configuration quiet nacelles is included. Author

N75-17335*# Kanner (Leo) Associates, Redwood City, Calif.
THE SIGNIFICANCE OF AERODYNAMIC JET INTERFERENCE IN DEVELOPMENT AND TESTING OF THE Do 31 V/STOL TRANSPORT
D. Welte Washington NASA Feb. 1974 25 p refs Transl. into ENGLISH from Deut. Ges. fur Luft-und Raumfahrt, Jahrestagung, 5th (Berlin) Paper 72-106, 4-6 Oct. 1972
(Contract NASw-2481)
(NASA-TT-F-16165; Paper-72-106) Avail: NTIS HC$3.25 CSCL 01C

Model measurements performed in the wind tunnel indicated a 3.5% lift loss during hover, increasing to 7 or 8% close to the ground. During transition, the jet-induced, tail-heavy moment demanded a large part of available trimming moment. A series of VTOL transitions flown by the Do 31 E3 test aircraft has been analyzed with regard to jet-induced forces and moments. Agreement between model and flight measurements is satisfactory, supporting the model engineering and model laws. A familiar, simple, semiempirical method for calculating jet-induced normal force during hover is extended to complex configurations such as that of the Do 31. Author

N75-17336*# Lockheed-California Co., Burbank.
STUDY OF ACTIVE COOLING FOR SUPERSONIC TRANSPORTS Final Report
G. D. Brewer and R. E. Morris Feb. 1975 152 p refs
(Contract NAS1-13226)
(NASA-CR-132573) Avail: NTIS HC $6.25 CSCL 01C

The potential benefits of using the fuel heat sink of hydrogen fueled supersonic transports for cooling large portions of the aircraft wing and fuselage are examined. The heat transfer would be accomplished by using an intermediate fluid such as an ethylene glycol-water solution. Some of the advantages of the system are: (1) reduced costs by using aluminum in place of titanium, (2) reduced cabin heat loads, and (3) more favorable environmental conditions for the aircraft systems. A liquid hydrogen fueled, Mach 2.7 supersonic transport aircraft design was used for the reference uncooled vehicle. The cooled aircraft designs were analyzed to determine their heat sink capability, the extent and location of feasible cooled surfaces, and the coolant passage size and spacing. Author

N75-17337# Royal Aircraft Establishment, Farnborough (England).
THE USE OF TITANIUM AND ITS ALLOYS IN THE MANUFACTURE OF HELICOPTERS AND AIRCRAFT STRUCTURES
A. Bourgeois and G. Sertour Nov. 1974 22 p Transl. into ENGLISH from Revue de Metallurgie (Paris), v. 71, no. 1, Nov. 1974 p 87-98
(BR44857; RAE-Lib-Trans-1816) Avail: NTIS HC $3.25

The important properties of titanium alloys are summarized and the specific properties of these alloys are compared with those of steels and aluminum alloys. The fatigue strength, the resistance to crack propagation and the stress corrosion behaviour of titanium alloys are discussed. Examples of titanium alloy structural components are given and the importance of titanium alloy fasteners is demonstrated. The use of titanium alloy stiffened structures is also noted, and attention is drawn to new products such as titanium alloy castings and extrusions, hydraulic tubing, and creep formed components. Author

N75-17338*# Virginia Univ., Charlottesville. Dept. of Engineering and Applied Science.
PRELIMINARY RIDE-QUALITY EVALUATION OF THE HM.2 HOVERFERRY
Eugene W. McClurken, Jr., I. D. Jacobson, and A. R. Kuhlthau Dec. 1974 11 p refs
(Grant NGR-47-005-181)
(NASA-CR-142290; Memo-403216) Avail: NTIS HC $3.25 CSCL 01B

The results of a forty-minute exposure of the HM.2 Hoverferry are presented. Quantitative evaluations were made from aft seats on the starboard side for a sea state considered calm and visually estimated at one-half to one foot. Since this type of craft is sensitive to sea state, the conclusions are based on ideal conditions. Some drawings are included. Author

N75-17339*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FUTURE LONG-RANGE TRANSPORTS: PROSPECTS FOR IMPROVED FUEL EFFICIENCY
A. L. Nagel, W. J. Alford, Jr., and J. F. Dugan, Jr. Feb. 1975 19 p refs
(NASA-TM-X-72659) Avail: NTIS HC $3.25 CSCL 01C

A status report is provided on current thinking concerning potential improvements in fuel efficiency and possible alternate fuels. Topics reviewed are: (1) historical trends in airplane efficiency; (2) technological opportunities including supercritical aerodynamics, (3) vortex diffusers, (4) composite materials, (5) propulsion systems, (6) active controls, and terminal-area operations; (7) unconventional design concepts, and (8) hydrogen-fueled airplane. Author

N75-17340*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
FLIGHT TEST INVESTIGATION OF THE VORTEX WAKE CHARACTERISTICS BEHIND A BOEING 727 DURING TWO-SEGMENT AND NORMAL ILS APPROACHES (A JOINT NASA/FAA REPORT)
M. R. Barber, R. L. Kurkowski, L. J. Garodz, G. H. Robinson, H. J. Smith, R. A. Jacobsen, G. W. Stinnett, Jr., T. C. McMurty, J. J. Tymczyszyn, R. L. Devereaux et al Jan. 1975 136 p refs
(NASA-TM-X-62398; FAA-NA-75-151) Avail: NTIS HC $5.75 CSCL 01C

Flight tests were performed to evaluate the vortex wake characteristics of a Boeing 727 aircraft during conventional and two-segment instrument landing approaches. Smoke generators were used for vortex marking. The vortex was intentionally intercepted by a Lear Jet and a Piper Comanche aircraft. The vortex location during landing approach was measured using a system of phototheodolites. The tests showed that at a given separation distance there are no readily apparent differences in the upsets resulting from deliberate vortex encounters during the two types of approaches. The effect of the aircraft configuration on the extent and severity of the vortices is discussed. Author

N75-17341*# Clemson Univ., S.C. Dept. of Mechanical Engineering.
A CURVE FITTING METHOD FOR SOLVING THE FLUTTER EQUATION M.S. Thesis
Jerry Lynn Cooper Dec. 1972 118 p refs
(Grant NGR-41-001-027)
(NASA-CR-132629) Avail: NTIS HC $5.25 CSCL 01C

A curve fitting approach was developed to solve the flutter equation for the critical flutter velocity. The psi versus nu curves are approximated by cubic and quadratic equations. The curve fitting technique utilized the first and second derivatives of psi with respect to nu. The method was tested for two structures, one structure being six times the total mass of the other structure. The algorithm never showed any tendency to diverge from the solution. The average time for the computation of a flutter velocity was 3.91 seconds on an IBM Model 50 computer for an accuracy of five per cent. For values of nu close to the critical root of the flutter equation the algorithm converged on the first attempt. The maximum number of iterations for convergence to the critical flutter velocity was five with an assumed value of nu relatively distant from the actual crossover. Author

N75-17342*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LANDING IMPACT STUDIES OF A 0.3-SCALE MODEL AIR CUSHION LANDING SYSTEM FOR A NAVY FIGHTER AIRPLANE
Trafford J. W. Leland and William C. Thompson Washington Mar. 1975 37 p refs
(NASA-TN-D-7875; L-9978) Avail: NTIS HC $3.75 CSCL 01C

An experimental study was conducted in order to determine the landing-impact behavior of a 0.3-scale, dynamically (but not physically) similar model of a high-density Navy fighter equipped with an air cushion landing system. The model was tested over a range of landing contact attitudes at high forward speeds and sink rates on a specialized test fixture at the Langley aircraft landing loads and traction facility. The investigation indicated that vertical acceleration at landing impact was highly dependent on the pitch angle at ground contact, the higher acceleration of approximately 5g occurring near zero body-pitch attitude. A limited number of low-speed taxi tests were made in order to determine model stability characteristics. The model was found to have good pitch-damping characteristics but stability in roll was marginal. Author

N75-17343*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MINIMIZATION OF SONIC-BOOM PARAMETERS IN REAL AND ISOTHERMAL ATMOSPHERES
Christine M. Darden Washington Mar. 1975 30 p refs
(NASA-TN-D-7842; L-9810) Avail: NTIS HC $3.75 CSCL 20A

The procedure for sonic-boom minimization introduced by Seebass and George for an isothermal atmosphere was converted for use in the real atmosphere by means of the appropriate equations for sonic-boom pressure signature advance, ray-tube area, and acoustic impedance. Results of calculations using both atmospheres indicate that except for low Mach numbers or high altitudes, the isothermal atmosphere with a scale height of 7620 m (25 000 ft) gives a reasonable estimate of the values of overpressure, impulse, and characteristic overpressure obtained by using the real atmosphere. The results also show that for aircraft design studies, propagation of a known F-function, or minimization studies at low supersonic Mach numbers, the isothermal approximation is not adequate. Author

N75-17344*# Grumman Aerospace Corp., Bethpage, N.Y.
SIMULATION OF HYPERSONIC SCRAMJET EXHAUST Final Report
R. A. Oman, K. M. Foreman, J. Leng, and H. B. Hopkins Washington NASA Mar. 1975 72 p refs
(Contract NAS1-12553)
(NASA-CR-2494) Avail: NTIS HC $4.25 CSCL 21E

A plan and some preliminary analysis for the accurate simulation of pressure distributions on the afterbody/nozzle portions of a hypersonic scramjet vehicle are described. The objectives fulfilled were to establish the standards of similitude for a hydrogen/air scramjet exhaust interacting with a vehicle afterbody, determine an experimental technique for validation of the procedures that will be used in conventional wind tunnel facilities, suggest a program of experiments for proof of the concept, and explore any unresolved problems in the proposed simulation procedures. It is shown that true enthalpy, Reynolds number, and nearly exact chemistry can be provided in the exhaust flow for the flight regime from Mach 4 to 10 by a detonation tube simulation. A detailed discussion of the required similarity parameters leads to the conclusion that substitute gases can be used as the simulated exhaust gas in a wind tunnel to achieve the correct interaction forces and moments. Author

N75-17345# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
SURFACE EFFECT TAKEOFF AND LANDING SYSTEM (SETOLS) Program Report, 1969 - 1973
Elmer T. Burgan and Fletcher C. Paddison Apr. 1974 47 p refs
(ARPA Order 798)
(AD-A000101; ARPA-TIO-74-21) Avail: NTIS CSCL 01/2

An ARPA Program Report on its program to develop the surface effect takeoff and land system (SETOLS) for high performance naval carrier-based aircraftj The report discusses the program's back-ground and technical need, the detailed plan to develop and demonstrate the technique, the program results, allocated resource levels, the contractor's performance and the program's impact. Author (GRA)

N75-17346# Lockheed-Georgia Co., Marietta.
APPLICATION OF THE EQUIVALENT MECHANICAL FLAP CONCEPT TO JET FLAPPED WING-BODY COMBINATIONS Final Technical Report, May - Dec. 1973
A. E. Holmes, Lane Barnett, and Willi F. Jacobs Nov. 1974 155 p refs
(Contract F33615-73-C-4142; AF Proj. 7071)
(AD-A000431; LG74ER0115; ARL-74-0136) Avail: NTIS CSCL 01/1

The analysis of powered lifting systems of the jet flap type requires an accounting of the mutual aerodynamic interference between the airframe (hard boundary) and the jet efflux (soft boundary). The development of a very generalized analysis technique is hardly feasible. However, the Externally Blown Flap (EBF), Upper Surface Blowing (USB), Internally Blown Flap (IBF), and the Augmentor wing (AW) constitute a family of powered lifting systems which are reducible to a common overall aerodynamic concept, but which differ primarily in their mechanical implementation and secondarily in aerodynamic detail. This report presents a relatively simple technique based on careful application of linearized theory. The method applies to the analogous systems mentioned above. The comparison of theoretical results with experimental data shows that the method is sufficiently accurate to be very useful in practice. GRA

N75-17347# Instrument Flight Center, Randolph AFB, Tex.
HELICOPTER TERPS VALIDATION STUDY, PHASE 1 Final Report
William E. Clark, Jr. and Gabriel P. Intano Oct. 1974 92 p
(AD-A000423; IFC-TR-74-4) Avail: NTIS CSCL 01/2

With the addition of Chapter 11 to AFM 55-9, an attempt was made to provide helicopters with specialized approach criteria. Chapter 11 criteria was written largely from opinion with little feasibility testing accomplished. Helicopter TERPs Validation Study, Phase I, was conducted in order to provide Chapter 11 criteria validation. Eight highly qualified Air Force Instructor Pilots (with varied helicopter experience) were utilized as subject pilots. Each subject flew five different approaches utilizing maximum descent gradients, utilizing minimum segment lengths for maximum intercept angles, and maneuvering at minimum distance from the facility. Included were VOR, TACAN and ILS type approaches. All approaches were flown at 90 knots. (Modified author abstract) GRA

N75-17348# General Dynamics/Convair, San Diego, Calif. Aerospace Div.
WEAPON SYSTEM COSTING METHODOLOGY FOR AIRCRAFT AIRFRAMES AND BASIC STRUCTURES. VOLUME 3: COST DATA BASE Interim Report, Jul. 1972 - Nov. 1973
R. E. Kenyon Jun. 1974 157 p ref
(Contract F33615-72-C-2083; AF Proj. 1368)
(AD-A000399; CASD-AFS-73-001; AFFDL-TR-73-129-Vol-3) Avail: NTIS CSCL 01/3

This volume presents the cost data used as the basis for developing the trade cost estimating technique for aerodynamic surfaces. Other data that has become available in the course of the study is also presented. Raw data and organized data are presented. An ultimate objective of the study with respect to the cost data base is to present back-up data for each individual CER, including both trade study and system costing relationships. The cost trend data that is included was produced under an amendment to the contract. Its intent was to provide a data base for cost estimate evaluation. Author (GRA)

N75-17349# Kaman Aerospace Corp., Bloomfield, Conn.
MECHANICAL INSTABILITY GROUND DYNAMICS PROGRAM Final Report
Ross F. Metzger Mar. 1974 61 p refs
(Contract N00019-73-C-0460)
(AD-A001101, R-1249) Avail: NTIS CSCL 01/3

A state-of-the-art survey has been performed to determine if any work has been performed which associates soil dynamics with mechanical instability in helicopters. None was found. No data pertaining to the range of near surface soil dynamic properties were found. A method of determining the mechanical stability of a helicopter in contact with the soil has been developed. A parametric study has been performed to examine the UH2 helicopter under conditions of a range soil properties. It was found that there are ranges of parameters which will cause

mechanical instability. It is recommended that a program be initiated to obtain quantitative near surface dynamic characteristics of representative soils through field testing. GRA

N75-17350# School of Aerospace Medicine, Brooks AFB, Tex.
PROPOSED WINDSHIELD FOR B-1 AIRCRAFT: AN OPTICAL EVALUATION Final Report, 1 May - 1 Sep. 1972
Wayne F. Provines, Benjamin Kislin, and Thomas J. Tredici Sep. 1974 12 p refs
(AF Proj. 7755)
(AD-A001078; SAM-TR-74-35) Avail: NTIS CSCL 01/3

A square sample segment, 25.4- by 25.4-cm (10- by 10-in.), representative of the B-1 aircraft proposed windshield was evaluated to determine if Air Force optical specifications would be met in the state-of-the-art production. The 3.53-cm-thick (1.39-in.) five-layer laminant segment was composed of acrylic, silicone, polycarbonate, silicone, and polycarbonate layers, repectively. Light transmission was 66% in normal position and 54% when sloped to the corresponding installed angle (65 degrees from normal). Deviation values, measured directly by displacement of a HeNe laser beam, varied from 0 to 7 min of arc when measured over the entire segment. A distortion map plotted at 2.54-cm (1-in.) intervals showed as much as a 3-min arc change per 2.54 cm. The haze value was 2.95%. GRA

N75-17351# Human Engineering Labs., Aberdeen Proving Ground, Md.
US ARMY HUMAN ENGINEERING LABORATORY HELICOPTER COCKPIT LIGHTING STUDY. PHASE 1: AN EVALUATION OF CURRENT AND POTENTIAL INSTRUMENT PANEL LIGHTING TECHNIQUES FOR USE IN ARMY HELICOPTERS
Harry R. Stowell and Alan M. Poston Aug. 1974 43 p refs
(AD-A001527; HEL-TN-7-74) Avail: NTIS CSCL 01/3

The objective of the study is to evolve lighting specifications which will alleviate current cockpit lighting problems. The objective of this phase was to quantitatively identify the problems with current lighting systems in Army helicopters. It also investigated the potential improvements afforded by some of the state-of-art lighting techniques. Luminance measurements were made at various points on instrument dial faces. Results are shown in tabular and pictorial forms. The results also showed that the current techniques of post and eyebrow lighting are unacceptable. From a comparison of all the techniques examined, the circular wedge technique gave the best light distribution. Illuminance measurements were made at the pilots' eye positions for use in other phases of the lighting study. GRA

N75-17352# National Aeronautical Establishment, Ottawa (Ontario).
RESULTS OF INTERCOMPARISON FLIGHTS BETWEEN THE NAE T-33 AND THE NCAR BUFFALO ATMOSPHERIC RESEARCH AIRCRAFT
J. I. MacPherson Jul. 1974 36 p refs
(AD-A001436; NRC-LR-577; NRC-14239) Avail: NTIS CSCL 01/3

Recent international atmospheric research programs such as BOMEX and IFYGL have been of such a large scale that several aircraft are required to collect data, which, when combined with radiosonde and surface measurements, ultimately form a large internationally-accessible data bank. A fundamental part of the program should be an intercomparison between the measuring aircraft. This report presents results of two such intercomparison flights between the NAE T-33 and NCAR Buffalo atmospheric research aircraft, with the NCAR Sabreliner providing additional data on one of the flights. Data from these flights, which were flown at different altitudes on two days with quite different atmospheric conditions, show generally good agreement, particularly for mesoscale meteorological parameters averaged over the length of a run. Spectra of microscale variables including true gust velocity, heat and momentum flux are compared over a frequency band common to both aircraft. The spectra for longitudinal gusts and temperature fluctuations show excellent agreement between the aircraft, but discrepancies are apparent in the Buffalo vertical gust spectra and resultant fluxes during these flights. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N75-17353*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INSTRUMENTATION AND CONTROL SYSTEM FOR AN F-15 STALL/SPIN
Felix L. Pitts, David C. E. Holmes, and Klaus P. Zaepfel Dec. 1974 74 p
(NASA-TM-X-72647) Avail: NTIS HC $4.25 CSCL 01D

An instrumentation and control system is described that was used for radio-controlled F-15 airplane model stall/spin research at the NASA-Langley Research Center. This stall/spin research technique, using scale model aircraft, provides information on the post-stall and spin-entry characteristics of full-scale aircraft. The instrumentation described provides measurements of flight parameters such as angle of attack and sideslip, airspeed, control-surface position, and three-axis rotation rates; these data are recorded on an onboard magnetic tape recorder. The proportional radio control system, which utilizes analog potentiometric signals generated from ground-based pilot inputs, and the ground-based system used in the flight operation are also described. Author

N75-17354# Boeing Aerospace Co., Seattle, Wash.
A PROCEDURE FOR THE DESIGN OF MULTIFUNCTION SWITCHING CONTROLS
David K. Graham Aug. 1974 143 p refs
(Contract N00014-72-C-0191; NR Proj. 213-088)
(AD-A000532; D180-15335-2; JANAIR-740702) Avail: NTIS CSCL 01/4

The handbook provides an independently usable, step-by-step procedure for the design of a multifunction switching control (MSC). An MSC is a matrix of switches which address a computer or other logic interface. This interface, in turn, addresses the system or subsystem to be controlled. Each switch in the matrix may have any number of different functions, its function at any given time determined by system state variables and the programming of the logic interface. The procedure itself is designed to effect the optimum trade between the number of switching controls required and associated operator workload. A conceptual design is developed first, based solely on system (and operator) requirements, to permit a quantitatively assessment of the effect of hardware constraints on the optimum design. Implementation constraints are subsequently introduced and methods of dealing with such constraints described. (Modified author abstract) GRA

N75-17355# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
STATISTICAL REVIEW OF COUNTING ACCELEROMETER DATA FOR NAVY AND MARINE FLEET AIRCRAFT Semiannual Summary Report, 1 Jan. 1962 - 30 Jun. 1974
Thomas A. DeFiore 1 Nov. 1974 137 p refs
(AD-A000092; NADC-13920-2) Avail: NTIS CSCL 01/3

This report is a specialized summary of normal acceleration data recorded by counting accelerometers. Data are separated by calendar time and mission category. Only data reported in the counting accelerometer program are included. Author (GRA)

N75-17356# Honeywell, Inc., Minneapolis, Minn.
VORTEX RATE SENSOR IMPROVEMENT PROGRAM Final Report, Jun. 1973 - Feb. 1974
D. R. Rask 3 Jun. 1974 65 p refs
(Contract N00156-71-C-0226; F41451402)
(AD-A001104; NADC-74126-40) Avail: NTIS CSCL 01/3

The objective of this program was to optimize the performance of the fluidic Vortex Rate Sensor (VRS), developed during the control system development program. This report describes the research test model, optimization tests performed, test results, and the optimized VRS design. Through controlled and systematic testing, the state of the art in VRS technology was advanced. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N75-17357# Boeing Co., Wichita, Kans.
FAA JT3D QUIET NACELLE RETROFIT FEASIBILITY PROGRAM. VOLUME 4: COMPATIBILITY ANALYSIS AND DESIGN STUDY FOR DC-8 AIRCRAFT Final Report, Aug. 1972 - Mar. 1973
Nov. 1973 87 p refs Prepared in cooperation with Douglas Aircraft Co., Long Beach, Calif.
(Contract DOT-FA71-WA-2628)
(AD-783187; FAA-RD-73-131-Vol-4; D3-9042-5) Avail: NTIS HC $4.00

Design study is presented of the possible application of the Boeing JT3D quiet nacelle to the current DC-8 short duct and long duct domestic aircraft fleet as exemplified by the DC-8-61 and DC-8-63 aircraft. The study indentified many physical and functional problems associated with the use of the Boeing quiet nacelle on DC-8 aircraft. Of the configurations studied, two configurations for the DC-8-61 and two configurations for the DC-8-63 were selected for cost evaluation. The configurations selected for each of the two DC-8 models were identified as Family 1 and Family 2. The Douglas discrete configurations, identified as Family 3, were also studied. Family 3 configurations utilize existing aircraft components to the greatest possible extent but do not emphasize 707/DC-8 fleet commonality. Thus each family represents an approach to acoustically treating both the short duct and long duct fleets of JT3D powered DC-8 aircraft. Also included is an abbreviated comparative cost analysis of all three families (seven configurations total) to determine which nacelle configurations, if retrofitted, would result in the least overall cost. Author

N75-17358# National Aerospace Lab., Tokyo (Japan).
INVESTIGATION OF AIR STREAM FROM COMBUSTOR-LINER AIR ENTRY HOLES, 3
Tetsuro Aiba and Tokuji Nakano 1974 23 p refs In JAPANESE; ENGLISH summary
(NAL-TR-369) Avail: NTIS HC $3.25

Jets flowing from air entry holes of the combustor liner of a gas turbine were investigated following previous experiments using simplified models. Cold air was supplied through the air entry holes into the primary hot-gas flows. The mass flow of the primary hot-gas and issuing jets was measured, and the behavior of the air-jets was studied by the measurement of the temperature distribution of the gas mixture. The air-jets flowing from three circular air entry holes parallel to the primary flow, single streamwise-long holes, and two opposing circular holes were studied along with the effects of jet and gas stream velocities, and of gas temperature. The discharge coefficient, the maximum penetration of the jets, the jet flow path, the mixing of the jets, and temperature distribution across the jets were investigated. Empirical expressions which describe the characteristics of the jets under the conditions of the experiments were formulated. The experimental results are compared with the results given by a standard circular hole and their characteristics are discussed. Author

N75-17359# National Aerospace Lab., Tokyo (Japan).
PRELIMINARY EXPERIMENTS ON FILM COOLING OF TURBINE BLADES WITH INJECTION NEAR THE LEADING EDGE. 1: INJECTION THROUGH HOLES LOCATED NEAR THE LEADING EDGE
Makoto Sasaki, Kitao Takahara, and Takao Kumagai 1974 22 p In JAPANESE; ENGLISH summary
(NAL-TR-371) Avail: NTIS HC $3.25

Experiments were made on film cooling with injection through holes located near the leading edge of a model in a low-speed, room-temperature wind tunnel. The model, which simulates the leading edge portion of an air-cooled turbine blade section, consists of a semicircular cylinder with four rows of blowing holes and two flat plates forming the upper and lower surfaces of its body. The change of flow coefficient of the blowing holes, the pressure distributions, and the temperature distributions (film cooling effectiveness) along the surface of several models were measured. It is shown that the inclination of the blowing holes in the spanwise direction shows very high effectiveness, but that excessive injection sometimes lowers the effectiveness. The film cooling effectiveness of the experimental model and of an air-cooled turbine nozzle are calculated by means of an approximate method. Author

N75-17360*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NOISE REDUCTION STUDIES FOR THE U-10 AIRPLANE
David A. Hilton, Andrew B. Connor, Harvey H. Hubbard, and Richard C. Dingeldein Apr. 1975 68 p refs
(NASA-TM-X-72640) Avail: NTIS HC $4.25 CSCL 01C

A study was undertaken by the NASA Langley Research Center to determine the noise reduction potential of the U-10 airplane in order to reduce its aural detection distance. Static and flyover noise measurements were made to document the basic airplane noise signature. Two modifications to the airplane configuration are suggested as having the best potential for substantially reducing aural detection distance with small penalty to airplane performance or stability and control. These modifications include changing the present 3-blade propeller to a 5-blade propeller, changing the propeller diameter, and changing the propeller gear ratio, along with the use of an engine exhaust muffler. The aural detection distance corresponding to normal cruising flight at an altitude of 1,000 ft over grassy terrain is reduced from 28,000 ft (5.3 miles) to about 50 percent of that value for modification 1, and to about 25 percent for modification 2. For the aircraft operating at an altitude of 300 ft, the analysis indicates that relatively straightforward modifications could reduce the aural detection distance to approximately 0.9 mile. Operation of the aircraft at greatly reduced engine speed (1650 rpm) with a 1.3-cu-ft muffler provides aural detection distances slightly lower than modification 1. Author

N75-17361*# KLD Associates, Inc., Huntington, N.Y.
BROADBAND NOISE GENERATED BY TURBULENT INFLOW TO ROTOR OR STATOR BLADES IN AN ANNULAR DUCT Final Report
Frank Lnae Washington NASA Mar. 1975 50 p refs
(Contract NAS1-10309)
(NASA-CR-2503; TR-4) Avail: NTIS HC $3.75 CSCL 20A

The Green's function relating the radiated pressure field to the fluctuating forces on rotor or stator blades is developed in the presence of dissipation due to turbulent velocity fluctuations and sound speed fluctuations. The resonances in the output power spectrum which would occur at the cut-off frequencies in the absence of dissipation should be removed and smeared out by the incorporation of dissipation. Wave number dependence is developed for an effective eddy viscosity due to the aforementioned fluctuations in the background medium. The space-time correlation function for blade-normal velocity fluctuations on a single or on two different blades is developed in terms of the velocity correlation tensor for the inflow under the assumptions of isotropy and (Taylor) frozen behavior. The correlation function is then simplified under certain approximations and the behavior of the blade-force correlation function is inferred. Author

N75-17362*# Advanced Technology Labs., Inc., Westbury, N.Y.
PREVAPORIZATION AND PREMIXING TO OBTAIN LOW OXIDES OF NITROGEN IN GAS TURBINE COMBUSTORS Final Report
Gerald Roffe and Antonio Ferri Washington NASA Mar. 1975 56 p refs
(Contract NAS3-17865)
(NASA-CR-2495; ATL-TR-203) Avail: NTIS HC $4.25 CSCL 21E

Tests were conducted to determine the effectiveness of prevaporization and premixing in reducing the formation of oxides of nitrogen in a gas turbine type combustor using liquid JP-5 fuel at the supersonic cruise condition. The combustor inlet temperature was 833 K (1500 R) at a pressure of 4 atmospheres and a reference velocity of 46 m/sec (150 ft/sec). An order of

magnitude reduction in nitric oxide emissions was achieved. Nitric oxide emission indices as low as 0.6 gm NO2/kg fuel were measured at an equivalence ratio of 0.29 with one percent combustion inefficiency without vitiation of the mixer stream.
Author

N75-17363*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN OF A VERY-LOW-BLEED MACH 2.5 MIXED-COMPRESSION INLET WITH 45 PERCENT INTERNAL CONTRACTION
Joseph F. Wasserbauer, Robert J. Shaw, and Harvey E. Neumann Washington Mar. 1975 71 p refs
(NASA-TM-X-3135; E-8098) Avail: NTIS HC $4.25 CSCL 21A

A full-scale, mixed-compression inlet was designed for operation with the TF30-P-3 turbofan engine and tested at Mach numbers of 2.5 and 2.0. The two-cone axisymmetric inlet had minimum internal contraction consistent with high total pressure recovery and low cowl drag. At Mach 2.5, inlet recovery was 0.906 with only 0.021 centerbody bleed mass-flow ratio and no cowl bleed. Increased centerbody bleed gave a maximum inlet unstart angle of attack of 6.85 deg. At Mach 2.0, inlet recovery was 0.94 with only 0.014 centerbody bleed mass-flow ratio and no cowl bleed. Inlet performance and angle-of-attack tolerance is presented for operation at Mach numbers of 2.5 and 2.0. Author

N75-17364# Royal Aircraft Establishment, Farnborough (England). Engineering Physics Dept.
STUDY OF SOLID STATE REMOTE CONTROL TECHNIQUES AS APPLIED TO THE REDESIGN OF THE ELECTRICAL SYSTEM IN A LARGE CIVIL AIRCRAFT
L. V. C. Jones London Aeron. Res. Council 1974 64 p refs Supersedes RAE-TR-72238; ARC-34764
(ARC-CP-1289; RAE-TR-72238; ARC-34764) Avail: NTIS HC $4.25; HMSO £1; PHI 43.90

A description is given of how the electrical power distribution system of a large civil aircraft might be redesigned to employ remote power controllers, embodying solid state protection, in conjunction with solid state logic, to operate circuits remotely through lightweight signal wires. An assessment of the masses of a conventional and a remotely controlled system, based on a VC-10 aircraft installation in which it is assumed that the latest lightweight cables and switchgear are used indicates that the remotely controlled system would be about 90kg lighter. Additional saving might result from equipment specifically designed to compatible with solid state remote control techniques. The effect on both systems of resiting the electrical compartment from the forward to a mid-aircraft position has been examined and it is concluded that a further saving of 36 kg would result with remote control. The redesigned system lends itself to, and has been arranged for, easy conversion to multiplexed data transmission. Although a multiplexed system was not assessed, the mass of cables and fittings that would be replaced has been evaluated as 42 kg, or 77 kg if analog circuits were included. Author (ESRO)

N75-17365# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOME QUESTIONS ON THE CREATION OF AN OPEN STAND FOR ACOUSTIC INVESTIGATIONS OF DTRD'S
A. I. Balmakov and V. G. Enenkov 22 Oct. 1974 25 p refs Transl. into ENGLISH from Tr. Rizhskii Inst. Inzh. Gradzhanskoi Aviats. (Riga), no. 174, 1971 p 135-152
(AD-A000660; FTD-MT-24-863-74) Avail: NTIS CSCL 21/5

Contemporary methods of experimental research on the acoustic characteristics of DTRD's are examined in the article. Primary attention is given to the full-scale experiment on an open stand. The purposes of acoustic investigations on DTRD's and the basic requirements for test conditions and open stand instrumentation and equipment are set forth. Two versions of the structural solution of the stand are described: stationary and movable. Basic information about the necessary open stand instrumentation and equipment is given. Author (GRA)

N75-17366# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF BOUNDARY CONDITIONS ON THE MOTION OF A CIRCUMFERENTIALLY NONUNIFORM FLOW IN THE AXISYMMETRICAL INPUT CHANNEL OF A COMPRESSOR
S. I. Ginsburg and L. A. Suslennikov 4 Oct. 1974 31 p refs Transl. into ENGLISH from sb. Statei Lopatochnye Mashiny Struynye Apparaty (USSR), no. 6, 1972 p 57-77
(AD-A000158; FTD-MT-24-670-74) Avail: NTIS CSCL 21/5

The report examines the effect on the spreading of a circumferentially nonuniform flow of boundary conditions behind the stage and the magnitudes of the axial flow clearance between the input guide device and the drive wheel. In this case the amplitude of the initial nonuniformity of the flow is not assumed to be low. GRA

N75-17367# Purdue Univ., Lafayette, Ind. Project Squid Headquarters.
PROJECT SQUID Semiannual Progress Report, 1 Oct. - 30 Sep. 1974
T. Adamson, E. Bruce, P. Chung, R. L. Simpson, and J. Fenn Oct. 1974 81 p refs
(Contract N00014-67-A-0226-0005; NR Proj. 098-038)
(AD-A000091) Avail: NTIS CSCL 05/2

Reports of progress during the past six months on the 15 research programs comprising Project SQUID are presented. The research programs fall into the areas of Aerodynamics, Turbulence, and Chemistry and Measurements. Project SQUID is a cooperative program of basic research related to jet propulsion. It is administered by Purdue University and sponsored by the Office of Naval Research. Author (GRA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N75-17368*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MONTE CARLO ANALYSIS OF INACCURACIES IN ESTIMATED AIRCRAFT PARAMETERS CAUSED BY UNMODELED FLIGHT INSTRUMENTATION ERRORS
Ward F. Hodge and Wayne H. Bryant Washington Feb. 1975 36 p refs
(NASA-TN-D-7712; L-9411) Avail: NTIS HC $3.75 CSCL 01A

An output error estimation algorithm was used to evaluate the effects of both static and dynamic instrumentation errors on the estimation of aircraft stability and control parameters. A Monte Carlo error analysis, using simulated cruise flight data, was performed for a high-performance military aircraft, a large commercial transport, and a small general aviation aircraft. The results indicate that unmodeled instrumentation errors can cause inaccuracies in the estimated parameters which are comparable to their nominal values. However, the corresponding perturbations to the estimated output response trajectories and characteristics equation pole locations appear to be relatively small. Control input errors and dynamic lags were found to be in the most significant of the error sources evaluated. Author

N75-17369# Royal Aircraft Establishment, Farnborough (England).
CONSIDERATIONS WHICH APPLY WHEN SELECTING A PLATFORM FOLLOW-UP SYSTEM AND FILTER FOR A VERTICAL REFERENCE UNIT
V. Held Nov. 1974 32 p refs Transl. into ENGLISH from DGON Symp. on Gyro Technol., West Ger., 1974
(BR44858; RAE-Lib-Trans-1802) Avail: NTIS HC $3.75

Lower limit of accuracy of vertical reference platforms is considered. Cases of a bob adjusted slaved platform and a free platform with the error in vertical are determined by a filter. Using an example in which system parameters and disturbance covariances were derived from in-flight measurements, a lower limit of estimated error is determined for an optimum filter using either purely inertial measurements or inertial plus Doppler velocity.

Quality ratings are given for suboptimal filters. The effects of incorrect a priori knowledge and the relative calculating times are discussed. Author

N75-17370*# Systems Control, Inc., Palo Alto, Calif.
INPUT DESIGN FOR IDENTIFICATION OF AIRCRAFT STABILITY AND CONTROL DERIVATIVES Final Report
Narendra K. Gupta and W. Earl Hall, Jr. Washington NASA Feb. 1975 134 p refs
(Contract NAS4-2068)
(NASA-CR-2493; H-864) Avail: NTIS HC $5.75 CSCL 01C

An approach for designing inputs to identify stability and control derivatives from flight test data is presented. This approach is based on finding inputs which provide the maximum possible accuracy of derivative estimates. Two techniques of input specification are implemented for this objective - a time domain technique and a frequency domain technique. The time domain technique gives the control input time history and can be used for any allowable duration of test maneuver, including those where data lengths can only be of short duration. The frequency domain technique specifies the input frequency spectrum, and is best applied for tests where extended data lengths, much longer than the time constants of the modes of interest, are possible. These techniques are used to design inputs to identify parameters in longitudinal and lateral linear models of conventional aircraft. The constraints of aircraft response limits, such as on structural loads, are realized indirectly through a total energy constraint on the input. Tests with simulated data and theoretical predictions show that the new approaches give input signals which can provide more accurate parameter estimates than can conventional inputs of the same total energy. Results obtained indicate that the approach has been brought to the point where it should be used on flight tests for further evaluation. Author

N75-17371*# Systems Technology, Inc., Hawthorne, Calif.
FLIGHT CONTROL SYSTEMS PROPERTIES AND PROBLEMS, VOLUME 1 Final Report
Duane T. McRuer and Donald E. Johnston Washington NASA Feb. 1975 169 p refs
(Contract NAS4-1881)
(NASA-CR-2500; TR-1018-1-Vol-1) Avail: NTIS HC $6.25 CSCL 01C

This volume contains a delineation of fundamental and mechanization-specific flight control characteristics and problems gleaned from many sources and spanning a period of over two decades. It is organized to present and discuss first some fundamental, generic problems of closed-loop flight control systems involving numerator characteristics (quadratic dipoles, non-minimum phase roots, and intentionally introduced zeros). Next the principal elements of the largely mechanical primary flight control system are reviewed with particular emphasis on the influence of nonlinearities. The characteristics and problems of augmentation (damping, stability, and feel) system mechanizations are then dealt with. The particular idiosyncracies of automatic control actuation and command augmentation schemes are stressed, because they constitute the major interfaces with the primary flight control system and an often highly variable vehicle response. Author

N75-17372*# Systems Technology, Inc., Hawthorne, Calif.
FLIGHT CONTROL SYSTEMS PROPERTIES AND PROBLEMS. VOLUME 2: BLOCK DIAGRAM COMPENDIUM Final Report
Donald E. Johnston Washington NASA Feb. 1975 148 p refs
(Contract NAS4-1881)
(NASA-CR-2501; TR-1018-1-Vol-2) Avail: NTIS HC $5.75 CSCL 01C

A compendium of stability augmentation system and autopilot block diagrams is presented. Descriptive materials for 48 different types of aircraft systems are provided. A broad representation of the many mechanical approaches which have been used for aircraft control is developed. Author

N75-17373# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
GUST LOADS ON 707 AND VC 10 AIRCRAFT
I. W. Kaynes London Aeron. Res. Council 1974 35 p refs
Supersedes RAE-TR-72156; ARC-34510
(ARC-CP-1281; RAE-TR-72156; ARC-34510) Avail: NTIS HC $3.75; HMSO 60p; PHI $2.55

Counting accelerometers were used to record the center of gravity normal accelerations on 707 and VC 10 aircraft during passenger services covering 1,870,000 km and 1,700,000 km respectively. A significant difference was found between the frequency of loads on two nominally indentical 707 aircraft, and the relationship of this to differences in autopilot characteristics is discussed. The most severe loads encountered by each aircraft are described. Author (ESRO)

N75-17374# National Aerospace Lab., Amsterdam (Netherlands).
EVALUATION OF THE EFFECT OF A YAW-RATE DAMPER ON THE LATERAL-DIRECTIONAL STABILITY AND CONTROL OF THE BEECHCRAFT QUEEN AIR 80 LABORATORY AIRCRAFT
L. J. Erkelens and C. F. G. M. Hofman 16 Nov. 1973 39 p refs
(NLR-TR-73105-U) Avail: NTIS HC $3.75

A series of flight tests were conducted with a Beechcraft Queen Air 80 aircraft to evaluate the effect of a simple yaw-rate damper on the lateral-directional stability and control characteristics. The flight tests were carried out after results of a stability analysis and analog simulation of a yaw-rate damper system were available. Responses of the following disturbances and excitations were recorded: (1) rudder kicks, (2) aileron steps, (3) aileron forcing function, and (4) atmospheric turbulence. Several instrument landing approaches in moderate turbulence were made with the yaw-rate damper alternately engaged and disengaged. The influence of engine failure recovery and aircraft stall behavior were investigated. Results are presented in the form of time histories, power spectra, and root-mean-square intensities.
Author (ESRO)

N75-17375# Douglas Aircraft Co., Inc., Long Beach, Calif.
METHODS FOR PREDICTING THE AERODYNAMIC AND STABILITY AND CONTROL CHARACTERISTICS OF STOL AIRCRAFT. VOLUME 1: BASIC THEORETICAL METHODS Final Report, 1 Jul. 1971 - 30 Dec. 1973
Mark I. Goldhammer, Michael L. Lopez, and Cheng-Chung Shen Dec. 1973 301 p refs
(Contract F33615-71-C-1861; AF Proj. 643A)
(AD-A001580; MDC-J5965-01; AFFDL-TR-73-146-Vol-1) Avail: NTIS CSCL 01/3

The primary goal of the study has been the development of a unified set of analytical methods which would provide the capability to calculate the stability and control characteristics of an arbitrary STOL aircraft configuration that might employ the internally ducted jet flap, externally blown jet flap, or a mechanical high lift system with vectored thrust. This volume presents the complete theoretical development of the relevant analytical methods. In addition, it presents comparisons of these methods with other analytical solutions and with experimental data. GRA

N75-17376# Douglas Aircraft Co., Inc., Long Beach, Calif.
METHODS FOR PREDICTING THE AERODYNAMIC AND STABILITY AND CONTROL CHARACTERISTICS OF STOL AIRCRAFT. VOLUME 2: STOL AERODYNAMIC METHODS COMPUTER PROGRAM Final Technical Report, 1 Jul. 1971 - 31 Nov. 1973
Mark I. Goldhammer and Norman F. Wasson Dec. 1973 229 p refs
(Contract F33615-71-C-1861; AF Proj. 643A)
(AD-A001581; MDC-J5965-02; AFFDL-TR-73-146-Vol-2) Avail: NTIS CSCL 01/3

The report describes the STOL Aerodynamic Methods Computer Program, which is intended to aid the engineer in the design and analysis of STOL aircraft employing internally ducted jet flaps, externally blown jet flaps, and mechanical flap systems with vectored thrust. The program provides capabilities to predict either the overall aerodynamic characteristics of a configuration or the aerodynamics of the following: Jet-wing (in or out of ground effect); wing and vectored jets; fuselage in the flow field of the jet-wing and/or vectored jets; empennage in the flow field of the jet-wing and/or vectored jets. The program includes the capabilities for investigating the effects of arbitray wing planforms with arbitrary high lift systems, including partial

span flaps, slats, and jets; arbitrary camber, twist, and jet deflection; fuselages with arbitrary cross-sections and upsweep; arbitrary empennage arrangements, including conventional tails, mid-tails, and T-tails; and a capability to calculate the off-body flow field induced by the jet-wing and/or vectored at arbitrary points. GRA

N75-17377# Douglas Aircraft Co., Inc., Long Beach, Calif.
METHODS FOR PREDICTING THE AERODYNAMIC AND STABILITY AND CONTROL CHARACTERISTICS OF STOL AIRCRAFT. VOLUME 3: ENGINEERING METHODS Final Report, 1 Jul. 1971 - 30 Nov. 1973
Mark I. Goldhammer and Michael L. Lopez Dec. 1973 258 p refs
(Contract F33615-71-C-186116; AF Proj. 643A)
(AD-A001582; MDC-J5965-03; AFFDL-TR-73-146-Vol-3) Avail: NTIS CSCL 01/3

This volume describes engineering methods for the prediction of the aerodynamic and stability and control characteristics of STOL aircraft employing internally ducted jet flaps, externally blown jet flaps, and mechanical flap systems with vectored thrust. These methods are intended to be used in conjunction with the theoretical methods and the associated computer program (STOL Aerodynamic Methods Computer Program) discussed in Volumes I and II, respectively. These engineering methods are intended to provide a rational approach for the aerodynamic analysis of complete STOL aircraft configurations and to provide semi-empirical methods to account for those effects not treated by the theoretical methods. These methods have been applied to configurations representative of each of the powered high-lift concepts, and the results of these analyses have been presented along with available experimental data to indicate the validity and range of applicability of the methods. GRA

N75-17378# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
VTOL AIRPLANE CONTROL IN TRANSITION REGIMES
A. P. Pashchenko 7 Oct. 1974 22 p Transl. into ENGLISH from Stroit. Mekh., Gazoaerodinamika Proiz-vo Letateln. Apparatov, Voronezh (USSR), no. 1, 1970 p 164-177
(AD-A000128; FTD-HC-23-1276-74) Avail: NTIS CSCL 01/3

The paper examines, from the problem formulation aspect, a fundamental scheme for semiautomatic control of the airplane in the transition regimes, which provides both reliable control of the airplane by the pilot and automatic stabilization of the airplane relative to the center of gravity. GRA

N75-17379# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
THREE-AXIS FLUIDIC/ELECTRONIC AUTOMATIC FLIGHT CONTROL SYSTEM FLIGHT TEST REPORT Final Report, 1 Jun. 1973 - 25 Jan. 1974
L. S. Cotton Aug. 1974 126 p refs
(Contract DAAG39-73-C-0237)
(AD-A000894; SER-50878; USAAMRDL-TR-74-62) Avail: NTIS CSCL 13/7

This report covers the flight test of a three-axis Hydrofluidic Stability Augmentation System (HYSAS) coupled with a completely independent parallel attitude and heading hold for a CH-54B helicopter. The design goal was to evaluate the performance of the CH-54B Automatic Flight Control System (AFCS) with the electronic SAS replaced with a fluidic SAS and to establish the technical base for a fluidic inner loop and electronic outer loop control system. (Modified author abstract) GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N75-17380 Polish Academy of Sciences, Warsaw.
AN ANALYSIS OF THE SUITABILITY OF ECHOLESS CHAMBERS FOR ACOUSTIC DIAGNOSTIC INVESTIGATIONS [OCENA PRZYDATNOSCI KOMOR BEZECHOWYCH DO AKUSTYCZNYCH BADAN DIAGNOSTYCZNYCH]
Tadeusz Wasala, Jerzy Motylewski, and Temasz Zmierczak 1973 24 p refs In POLISH
(Rept-1/1973) Avail: Issuing Activity

Anechoic chambers were investigated on the basis of an analysis of the basic parameters of these chambers. Methods are presented and discussed for measuring the anechoic chamber parameters, such as the lower boundary frequencies, acoustical soundness of materials, and inequality of acoustical field distribution. Transl. by M.J.S.

N75-17381*# Virginia Univ., Charlottesville.
AN INVESTIGATION OF ROOFTOP STOLPORT AERODYNAMICS
Jeffrey N. Blanton and Hermon M. Parker [1972] 82 p refs
(Grant NGR-47-005-146)
(NASA-CR-132570) Avail: NTIS HC $4.75 CSCL 01E

An investigation into aerodynamic problems associated with large building rooftop STOLports was performed. Initially, a qualitative flow visualization study indicated two essential problems: (1) the establishment of smooth, steady, attached flow over the rooftop, and (2) the generation of acceptable crosswind profile once (1) has been achieved. This study indicated that (1) could be achieved by attaching circular-arc rounded edge extensions to the upper edges of the building and that crosswind profiles could be modified by the addition of porous vertical fences to the lateral edges of the rooftop. Important fence parameters associated with crosswind alteration were found to be solidity, fence element number and spacing. Large scale building induced velocity fluctuations were discovered for most configurations tested and a possible explanation for their occurrence was postulated. Finally, a simple equation relating fence solidity to the resulting velocity profile was developed and tested for non-uniform single element fences with 30 percent maximum solidity. Author

N75-17382# Atomic Weapons Research Establishment, Aldermaston (England).
FOULNESS MULTI-TON AIR BLAST SIMULATOR. PART 1: EARLY DEVELOPMENT: THE GUN DRIVEN FACILITY
P. M. Clare and R. D. Rowe Jul. 1974 46 p refs
(AWRE-O-31/74) Avail: AEC Depository Libraries HC $5.50

The development and performance of a blast simulator for studying the vulnerability of military equipment to nuclear explosions are described. The blast simulator is an explosively driven shock tube that simulates weapons in the multi-ton range. NSA

N75-17383# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
CIVIL AIRCRAFT AIRWORTHINESS DATA RECORDING PROGRAMME. UNEVEN RUNWAYS ENCOUNTERED BY SUBSONIC JET TRANSPORT AIRCRAFT DURING SCHEDULED AIRLINE OPERATIONS
G. B. Hutton London Aeron. Res. Council 1974 28 p refs Supersedes RAE-TR-72095; ARC-34499
(ARC-CP-1287; RAE-TR-72095; ARC-34499; CAADRP-TR-25) Avail: NTIS HC $3.75; HMSO 50p; PHI $2.15

During the Civil Aircraft Airworthiness Data Recording Program instances were found where runway unevenness at two international airports produced CG normal acceleration oscillations of unusually large amplitudes for brief periods during the takeoff or landing run. Flight records of events are reproduced and discussed, one runway/aircraft combination being dealt with in particular detail owing to the phenomenon occurring frequently and being a source of comment from pilots. There has been no known evidence of aircraft damage resulting from the events but some contribution to fatigue damage could occur, particularly on aircraft types with heavy wing-mounted appendages. It is suggested that selective resurfacing of the runways could considerably alleviate the loading action. Author (ESRO)

N75-17384# European Space Research Organization, Paris (France).
AIRCRAFT FLUTTER SIMULATION BY MEANS OF THE ELECTRONIC ANALOGUE COMPUTER WITH SPECIAL REGARD TO STRUCTURAL NONLINEARITIES
E. Breitbach Dec. 1974 128 p refs Transl. into ENGLISH of Flattersimulation des Flugzeuges mit Hilfe des Elektron. Analogrechners unter besonderer Beruecksichtigung struktureller Nichtlinearitaeten DLR-FB-73-30, DFVLR, Jan. 1973
(ESRO-TT-121; DLR-FB-73-30) Avail: NTIS HC $5.75; DFVLR, Porz, West Ger. 39DM

The fundamental theoretical relations for aircraft flutter simulation by means of an electronic analogue computer and a general description of an appropriate computer realization are presented. Proceeding from Lagrange's equations the governing aeroelastic stability equations are given in terms of natural mode functions. For a real time flutter simulation the unsteady aerodynamic forces are determined by application of the two-dimensional incompressible strip theory including Wagner's function for arbitrary non-uniform motions. The practical application of the developed method is demonstrated for a wing-aileron system, and some typical results are presented and discussed. As a special advantage of the analogue simulation, the influence of a nonlinear aileron hinge stiffness on the flutter stability is investigated for numerous variations of spring characteristics. Author (ESRO)

N75-17385# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD OF ELECTROMECHANICAL SIMULATION OF THE ELASTIC OSCILLATIONS OF AN AIRCRAFT IN FLIGHT
V. I. Smyslov and S. P. Strelkov 15 Oct. 1974 15 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Aviats. Tekhn. (Kazan), v. 10, no. 40, 1967 p 88-93
(AD-A000645; FTD-HT-23-1962-74) Avail: NTIS CSCL 20/4

Owing to the variety of designs and appearance of aircraft it is quite difficult to correctly determine the initial forms or critical rate of flutter, and new methods of research on elastic oscillations of an aircraft in flight are investigated. One of these, the method of electromechanical simulation of the elastic oscillations of an aircraft in flight, is described. GRA

N75-17386# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
FREE SURFACE WATER TUNNEL IMPROVEMENT STUDY Final Report
Marty J. Fegley, Ronald C. Pare, and Thomas M. Ward 1 Oct. 1974 74 p refs
(Contract N00014-67-A-0094-0030)
(AD-A000495; GALCIT-FSWT-146) Avail: NTIS CSCL 14/2

The results of a study to improve the performance of a free surface water tunnel located at the California Institute of Technology are presented. Improvements are described which will permit index of cavitation modeling of craft operating in excess of 90 knots on the free surface of the ocean.
Author (GRA)

N75-17387# Naval Air Test Center, Patuxent River, Md.
ELECTRO-OPTICAL TEST RANGE
L. S. Koeng 1974 23 p
(AD-A000968) Avail: NTIS CSCL 14/2

The brochure provides governmental/contractor agencies associated with research, development, fabrication, test, and evaluation of electro-optical sensors with a description of the Naval Air Test Center Electro-Optical Test Range. GRA

N75-17388# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE MODIFIED EXPANSION TUBE: THEORY AND EXPERIMENT Final Report
F. H. Oertel, N. Gerber, and J. M. Bartos Sep. 1974 35 p refs
(DA Proj. 1T1-61102-A-33H)
(AD-A001551; BRL-1741) Avail: NTIS CSCL 14/2

The BRL expansion tube has been modified by the insertion of a nozzle plate immediately downstream of the second diaphragm with the purpose of improving reproducibility and uniformity of test flows. Results of experiments in the modified expansion tube are reported for a nozzle plate with square nozzles into which the second diaphragm petals under action of the shock wave produced by the opening of the first diaphragm. This nozzle plate was designed as an improvement on one with counter-bored conical nozzles already in use. The influence of a nozzle plate on the expansion tube cycle is examined. Comparisons are made between the new nozzle plate and the earlier one. Results of a comprehensive set of computations for the modified expansion tube are presented, with emphasis on flow properties in the test section; computations are compared with experimental results. GRA

N75-17389# Naval Training Equipment Center, Orlando, Fla.
PROCEEDINGS OF NTEC/INDUSTRY CONFERENCE, 7TH Final Report
Nov. 1974 302 p refs Conf. held at Orlando, Fla., 19-21 Nov. 1974
(AD-A000970; NAVTRAEQUIPC-IH-240) Avail: NTIS CSCL 05/9

The papers present a variety of technical and training subjects related to training device technology and training methodology. The conference theme Training Economy Through Simulation provides a common base for the examination and discussion of the various aspects of simulation that can and will be utilized to solve today's training requirements through the economy of simulation. The seventh conference is part of a continuing program to promote cooperation between Government and industry in the procurement of training equipment, and to foster an exchange of ideas on new simulation technology. GRA

N75-17390# Riverside Research Inst., New York.
RADC SOI TEST FACILITY TECHNICAL ASSISTANCE PROGRAM Final Technical Report, 30 Jan. 1973 - 30 Jul. 1974
T. Grish and E. Weitzman 31 Jul. 1974 105 p refs
(Contract F30602-73-C-0097; ARPA Order 2080; AF Proj. 2080)
(AD-A001087; RRI-F-1/280-4-00; RADC-TR-74-251) Avail: NTIS CSCL 17/9

This final progress report summarizes the technical status of tasks sponsored by the Strategic Technology Office of the Defense Advanced Research Projects Agency and carried out for the Rome Development Center (RADC) of the Air Force Systems Command, during the period 1 Feb 73 to 31 Jul 74. During this period Riverside Research Institute's efforts were concentrated primarily on (1) providing technical guidance and assistance to RADC and its O and M Contractor, RCA, in carrying out measurements and upgrading of the transmitter and signal processing subsystems, (2) carrying out a study of requirements for, and recommendation of, candidate on-site computers, (3) acquisition of a third generation computer for the Floyd Site Wideband Radar, and (4) preliminary design for integrating the computer into the radar. Author (GRA)

N75-17391# School of Aerospace Medicine, Brooks AFB, Tex.
A LASER-GENERATED VISUAL DISPLAY AND TRACKING TASK FOR A LINK GAT-1 FLIGHT TRAINER Final Report, Mar. 1973 - Jun. 1974
Peter H. Henry and Edward J. Engelken Sep. 1974 31 p refs
(AD-A001079; SAM-TR-74-36) Avail: NTIS CSCL 05/9

A prototype test system has been developed for use with a Singer Co. GAT-1 flight trainer that permits assessment of a pilot's ability to track a target which moves about three separate axes: vertically (altitude), laterally, and in depth (range). A low-cost laser-generated visual display and rear projection screen was used to create the visual tracking task which is crudely akin to aerial refueling or formation flying. Performance was assessed on-line in terms of: (1) integrated absolute tracking error and (2) time on target, by using a bench top analog computer (EAI model TR-10) and simple hardware. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N75-17392*# MRC Corp., Baltimore, Md.
PRELIMINARY DESIGN POLYMERIC MATERIALS EXPERIMENT
Samuel G. Mattingly, Edward T. Rude, and Robert L. Marshner 1 Mar. 1975 81 p refs
(Contract NAS1-13293)
(NASA-CR-132569; MRC-658) Avail: NTIS HC $4.75 CSCL 22A

A typical Advanced Technology Laboratory mission flight plan was developed and used as a guideline for the identification of a number of experiment considerations. The experiment logistics beginning with sample preparation and ending with sample analysis are then overlaid on the mission in order to have a complete picture of the design requirements. The results of this preliminary design study fall into two categories. First specific preliminary designs of experiment hardware which is adaptable to a variety of mission requirements. Second, identification of those mission considerations which affect hardware design and will require further definition prior to final design. Finally, a program plan is presented which will provide the necessary experiment hardware in a realistic time period to match the planned shuttle flights. A bibliography of all material reviewed and consulted but not specifically referenced is provided. Author

N75-17393*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LIQUID FILM DEMONSTRATION EXPERIMENT SKYLAB SL-4
Wesley Darbro Jan. 1975 28 p refs
(NASA-TM-X-64911) Avail: NTIS HC $3.75 CSCL 22C

The liquid film demonstration experiment performed on Skylab 4 by Astronaut Gerald Carr, which involved the construction of water and soap films by boundary expansion and inertia, is discussed. Results include a 1-ml globule of water expanded into a 7-cm-diameter film as well as complex film structures produced by inertia whose lifetimes are longer in the low-g environment. Also discussed are 1-g acceleration experiments in which the unprovoked rupture of films was photographed and film lifetimes of stationary and rotated soap films were compared. Finally, there is a mathematical discussion regarding minimal surfaces, an isoperimetric problem, and liquid films. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N75-17394*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TECHNIQUES FOR TRAJECTORY OPTIMIZATION USING A HYBRID COMPUTER
P. L. Neely 7 Feb. 1975 47 p refs
(NASA-TM-X-64906) Avail: NTIS HC $3.75 CSCL 22A

The use of a hybrid computer in the solution of trajectory optimization problems is described. The solution technique utilizes the indirect method and requires iterative computation of the initial condition vector of the co-state variables. Convergence of the iteration is assisted by feedback switching and contour modification. A simulation of the method in an on-line updating scheme is presented. Author

N75-17395*# Colorado Univ., Boulder.
OPTIMUM THREE-DIMENSIONAL ATMOSPHERIC ENTRY FROM THE ANALYTICAL SOLUTION OF CHAPMAN'S EXACT EQUATIONS
Adolf Busemann, Nguyen X. Vinh (Michigan Univ., Ann Arbor), and Robert D. Culp [1974] 61 p refs
(Grant NsG-1056)
(NASA-CR-132571) Avail: NTIS HC $4.25 CSCL 22A

The general solution for the optimum three-dimensional aerodynamic control of a lifting vehicle entering a planetary atmosphere is developed. A set of dimensionless variables, modified Chapman variables, is introduced. The resulting exact equations of motion, referred to as Chapman's exact equations, have the advantage that they are completely free of the physical characteristics of the vehicle. Furthermore, a completely general lift-drag relationship is used in the derivation. The results obtained apply to any type of vehicle of arbitrary weight, dimensions and shape, having an arbitrary drag polar, and entering any planetary atmosphere. The aerodynamic controls chosen are the lift coefficient and the bank angle. General optimum control laws for these controls are developed. Several earlier particular solutions are shown to be special cases of this general result. Results are valid for both free and constrained terminal position. Author

N75-17396*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
OUTER PLANET MISSION GUIDANCE AND NAVIGATION FOR SPINNING SPACECRAFT
Charles Kendall Paul, Robert Kent Russell, and Jordan Ellis 26 Apr. 1974 38 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Spacecraft and Rockets on Jun. 1975
(Contract NAS7-100)
(NASA-CR-136764) Avail: NTIS HC $3.75 CSCL 22A

The orbit determination accuracies, maneuver results, and navigation system specification for spinning Pioneer planetary probe missions are analyzed to aid in determining the feasibility of deploying probes into the atmospheres of the outer planets. Radio-only navigation suffices for a direct Saturn mission and the Jupiter flyby of a Jupiter/Uranus mission. Saturn ephemeris errors (1000 km) plus rigid entry constraints at Uranus result in very high velocity requirements (140 m/sec) on the final legs of the Saturn/Uranus and Jupiter/Uranus missions if only Earth-based tracking is employed. The capabilities of a conceptual V-slit sensor are assessed to supplement radio tracking by star/satellite observations. By processing the optical measurements with a batch filter, entry conditions at Uranus can be controlled to acceptable mission-defined levels (+ or - 3 deg) and the Saturn-Uranus leg velocity requirements can be reduced by a factor of 6 (from 139 to 23 m/sec) if nominal specified accuracies of the sensor can be realized. Author

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N75-17397*# General Electric Co., Philadelphia, Pa. Space Div.
PASSIVE STABILIZATION OF THE LONG DURATION EXPOSURE FACILITY (LDEF) Final Report
Aniruddha Das 5 Nov. 1974 164 p refs
(Contract NAS1-13440)
(NASA-CR-132566; Doc-74SD4264) Avail: NTIS HC $6.25 CSCL 22B

The results of a study on the application of the magnetically anchored rate damper to gravity gradient stabilization of the Long Duration Exposure Facility (LDEF) are presented. The analyses and simulations required to investigate the use of an existing viscous magnetic rate damper for rate stabilizing the LDEF spacecraft were performed. The following tasks were included: linear performance estimates, capture and damper requirements, and performance prediction. Each of these tasks was performed for two gravity gradient stabilization configura-

tions; an axisymmetric configuration for two-axis (pitch and roll) stability; and a non-axisymmetric configuration for three-axis stability. The results are presented by stabilization configuration.
Author

N75-17398*# Operations Research, Inc., Silver Spring, Md.
STUDY OF ADVANCED SYSTEM FOR POSITION LOCATION AND NAVIGATION Final Report
Aug. 1972 79 p
(Contract NAS5-21685)
(NASA-CR-143681) Avail: NTIS HC $4.75 CSCL 17G

Concepts are investigated for improving location precision and system capacity relative to current satellite based data collection and location systems. The TRILOC concept provides either or both improvements in location and system capacity by utilizing three measurements acquired during a single transmission from a platform for location purposes. The location algorithm is developed, and range differences are measured onboard the satellite. An error analysis then relates platform location errors to the precision with which the measurements are made. The second concept is to increase system capacity by means of directive antennas onboard the satellite for reducing interference and/or reducing platform power. The potential advantages and disadvantages of both sweeping and fixed directive antennas for random access systems are evaluated. N.E.R.

N75-17399*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
SCOUT FOURTH STAGE ATTITUDE AND VELOCITY CONTROL (AVC) SYSTEM FEASIBILITY STUDY
L. B. Byars Feb. 1975 172 p ref
(Contract NAS1-10000)
(NASA-CR-132560) Avail: NTIS HC $6.25 CSCL 22B

The feasibility of incorporating a guidance system in the Scout fourth stage to achieve a significant improvement in expected payload delivery accuracy is studied. The technical investigations included the determination of the AVC equipment performance requirements, establishment of qualification and acceptance test levels, generation of layouts illustrating design approaches for the upper D and payload transition sections to incorporate the hardware, and the preparation of a vendor bid package. Correction concepts, utilizing inertial velocity and attitude, were identified and evaluated. Fourth stage attitude adjustments as determined from inertial velocity variation through the first three stages and a final velocity correction based upon the measured in-plane component errors at injection were employed. Results show radical reductions in apogee-perigee deviations.
Author

N75-17400*# TRW Systems Group, Redondo Beach, Calif.
FAULT TOLERANT PROGRAMMABLE DIGITAL ATTITUDE CONTROL ELECTRONICS STUDY Final Report
A. A. Sorensen 25 Jul. 1974 479 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953883)
(NASA-CR-142289; TRW-26084-6001-RU00) Avail: NTIS HC $12.00 CSCL 22B

The attitude control electronics mechanization study to develop a fault tolerant autonomous concept for a three axis system is reported. Programmable digital electronics are compared to general purpose digital computers. The requirements, constraints, and tradeoffs are discussed. It is concluded that: (1) general fault tolerance can be achieved relatively economically, (2) recovery times of less than one second can be obtained, (3) the number of faulty behavior patterns must be limited, and (4) adjoined processes are the best indicators of faulty operation.
F.O.S.

N75-17401# Aerospace Corp., El Segundo, Calif. Lab Operations.
EFFECTS OF MERIDIONAL WINDS ON THE INTERPRETATION OF SATELLITE INCLINATION DATA Interim Report
Joe M. Strauss and Barbara K. Ching Oct. 1974 11 p refs
(Contract F04701-74-C-0075)
(AD-787855; TR-0075(5260-10)-1; SAMSO-TR-74-229) Avail: NTIS CSCL 22/3

Recent observations of changes in inclinations of artificial satellites have been interpreted in terms of variations of thermospheric zonal winds with local time. It is suggested that meridional winds may have a pronounced effect on satellite inclinations, so that both wind components should be considered in this type of analysis. Author (GRA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N75-17402 British Library Lending Div., Boston Spa (England).
WIDE-BAND INFORMATION SWITCHING SYSTEMS USING LASER BEAM MATRIX SWITCHES
Bernhard Hill 4 Oct. 1974 20 p refs Transl. into ENGLISH from Nachrichtentech. Z. (West Germany), no. 9, 1972 p 385-389
(BLL-Trans-3116-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The development of optical principles of large capacity memories for communications applications is discussed. The optical components considered are the digital laser beam deflectors and erasable holographic memories. The operation of each type of component is described. The fundamental idea of optical information switching using a matrix switch of light deflectors is presented. Another technique of light deflection with the hologram of a two beam interference is reported. Diagrams are provided to illustrate the optical principles involved in the communications systems. Author

N75-17403*# National Aeronautics and Space Administration, Washington, D.C.
OFFICE OF TRACKING AND DATA ACQUISITION
Feb. 1975 8 p
(NASA-News-Release-75-45) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I.Airport, Maryland 21240 CSCL 22C

The Office of Tracking and Data Acquisition (OTDA) and its two worldwide tracking network facilities, the Spaceflight Tracking and Data Network and the Deep Space Network, are described. Other topics discussed include the NASA communications network, the tracking and data relay satellite system, other OTDA tracking activities, and OTDA milestones. M.J.S.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-17404*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SUBSONIC AND TRANSONIC DYNAMIC STABILITY DERIVATIVES OF A MODIFIED 089B SHUTTLE ORBITER
Richmond P. Boyden and Delma C. Freeman Dec. 1974 157 p refs
(NASA-TM-X-72631) Avail: NTIS HC $6.25 CSCL 22B

An experimental test program has been conducted to measure the dynamic stability derivatives of a modified 089B shuttle orbiter. Subsonic and transonic forced oscillation tests were conducted in the Langley 8 foot TPT tunnel over a Mach number range from 0.3 to 1.2 for angles of attack up to 22 deg. The data were measured at the model resonant frequency with pitch and yaw amplitudes of 1 deg and a roll amplitude of 2.5 deg.
Author

N75-17405*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SOUND ABSORPTION OF LOW-TEMPERATURE REUSABLE SURFACE INSULATION CANDIDATE MATERIALS
J. D. Johnston Dec. 1974 23 p
(NASA-TM-X-58144; JSC-09164) Avail: NTIS HC $3.25 CSCL 22B

Sound absorption data from tests of four candidate low-temperature reusable surface insulation materials are presented. Limitations on the use of the data are discussed, conclusions concerning the effective absorption of the materials are drawn, and the relative significance to Vibration and Acoustic Test Facility test planning of the absorption of each material is assessed.
Author

N75-17406*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPACECRAFT ATTITUDE CONTROL FOR A SOLAR ELECTRIC GEOSYNCHRONOUS TRANSFER MISSION
Bruce E. Leroy and John D. Regetz 1975 14 p refs Presented at 11th Elec. Propulsion Conf., New Orleans, 19-21 Mar. 1975; sponsored by AIAA
(NASA-TM-X-71669; E-8256) Avail: NTIS HC $3.25 CSCL 22B

A study of the Attitude Control System (ACS) is made for a solar electric propulsion geosynchronous transfer mission. The basic mission considered is spacecraft injection into a low altitude, inclined orbit followed by low thrust orbit changing to achieve geosynchronous orbit. Because of the extended thrusting time, the mission performance is a strong function of the attitude control system. Two attitude control system design options for an example mission evolve from consideration of the spacecraft configuration, the environmental disturbances, and the probable ACS modes of operation. The impact of these design options on other spacecraft subsystems is discussed. The factors which must be considered in determining the ACS actuation and sensing subsystems are discussed. The effects of the actuation and sensing subsystems on the mission performance are also considered.
Author

N75-17407*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS FROM INVESTIGATIONS IN THE NASA/MSFC TWT ON A .004 SCALE MODEL SPACE SHUTTLE LAUNCH VEHICLE (MODEL 13P-OTS) TO DETERMINE GAS SUPPLY STRUT EFFECTS ON MODEL PRESSURE ENVIRONMENT (IA53)
W. P. Garton (Rockwell Intern., Huntsville, Ala.) Jan. 1975 290 p
(Contract NAS9-13247)
(NASA-CR-141504; DMS-DR-2123) Avail: NTIS HC $8.75 CSCL 22A

The Rockwell Space Shuttle Launch Vehicle components were tested in a Trisonic Wind Tunnel. Pressure measurements were made on the aft portion, in the base regions, and on the wing surfaces. Axial force determination were made from the pressure data. Data were recorded with the model at zero degrees angle of attack and sideslip through a Mach number from 0.9 to 3.0. The only configuration changes investigated were strut mounting techniques and gas line fairing location between the external tank and the orbiter.
Author

N75-17408*# Chrysler Corp., New Orleans, La. Space Div.
AERODYNAMIC CHARACTERISTICS OF MSFC MODEL 454 OF THE 142 INCH SOLID ROCKET BOOSTER TESTED IN THE LeRC 10 FOOT SWT AT MACH NUMBERS OF 2.0 AND 2.7 (SA6F)
Josh D. Johnson (NASA. Marshall Space Flight Center), Paul L. Burstadt (NASA. Lewis Res. Center), and Walter D. Radford (Northrop Services, Inc., Huntsville, Ala.) Jan. 1975 293 p refs
(Contract NAS9-13247)
(NASA-CR-134422; DMS-DR-2161) Avail: NTIS HC $8.75 CSCL 22B

A 2.112 percent scale Space Shuttle Solid Rocket Booster (SRB) was tested in a ten foot, supersonic wind tunnel. The test Mach numbers were 2.0 and 2.7. Test angles of attack were from minus 5 degrees to plus 185 degrees. The Reynolds numbers ranged from 0.514 to 2.81 million per foot. Test roll angles were 0, 22.5, 45, 90, and 135 degrees. The following configurations were tested: (1) SRB without external protuberances, (2) SRB with an electrical tunnel and a thrust attachment structure, (3) SRB with two engine shroud strakes, (4) SRB with eight engine shroud strakes, and (5) SRB with an electrical tunnel, thrust attachment structure, eight engine shroud strakes, and separation motors.
Author

N75-17409*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF FLOW VISUALIZATION TESTS OF 0.010-SCALE SPACE SHUTTLE MODELS 32-OTS AND 52-0 IN THE AEDC VKF TUNNEL A (IA61B)
J. J. Daileda (Rockwell Intern. Corp., Downey, Calif.) Feb. 1975 64 p
(Contract NAS9-13247)
(NASA-CR-141507; DMS-DR-2226) Avail: NTIS HC $4.25 CSCL 22A

Results of oil flow visualization tests of an 0.010-scale model of the space shuttle vehicle configuration 3 are presented. The test was conducted at Mach numbers of 3.75 and 5.03 in the AEDC VKF Tunnel A during February 1974. Angles of attack of -5, 0, and 30 degrees and angles of sideslip of 0 and 5 degrees were investigated.
Author

N75-17410*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OPERATING CHARACTERISTICS OF A HOLLOW-CATHODE NEUTRALIZER FOR 5 AND 8 CENTIMETER-DIAMETER ELECTRON BOMBARDMENT MERCURY ION THRUSTERS
Albert J. Weigand Washington Mar. 1975 18 p refs
(NASA-TM-X-3209; E-8176) Avail: NTIS HC $3.25 CSCL 21C

Thin-tip 0.3-cm-outside-diameter hollow-cathode neutralizers were used to investigate causes of neutralizer tip erosion experienced in thruster endurance tests. Bell-jar tests indicated that neutralizers with new rolled tantalum foil inserts coated with an emissive mixture eroded very little over the neutral flow rates investigated (3 to 10 mA) for simulated 5- and 8-cm-diameter thruster neutralizer conditions. Tip erosion rates of neutralizers operated with no insert or emissive mixture increased by two orders of magnitude for both configurations as the neutral flow rate decreased. Spectroscopic analysis of the discharge plasma from neutralizers operated with inserts coated with the emissive mixture detected tungsten at all neutral flow rates for both thruster neutralizer conditions. The only source of tungsten was the tip. Therefore, detection of tungsten indicated neutralizer tip erosion. Barium, an element of the emissive mixture, was detected at low neutral flow rates for the 5-cm-diameter thruster neutralizer operating condition only.
Author

N75-17411*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARATIVE EVALUATION OF TEST METHODS TO SIMULATE ACOUSTIC RESPONSE OF SHROUD-ENCLOSED SPACECRAFT STRUCTURES
Frank J. On Washington Mar. 1975 64 p refs
(NASA-TN-D-7912; G-7553) Avail: NTIS HC $4.25 CSCL 22B

Test methods were evaluated to ascertain whether a spacecraft, properly tested within its shroud, could be vibroacoustic tested without the shroud, with adjustments made in the acoustic input spectra to simulate the acoustic response of the missing shroud. The evaluation was based on vibroacoustic test results obtained from a baseline model composed (1) of a spacecraft

with adapter, lower support structure, and shroud; (2) of the spacecraft, adapter, and lower structure, but without the shroud; and (3) of the spacecraft and adapter only. Emphasis was placed on the magnitude of the acoustic input changes required to substitute for the shroud and the difficulty of making such input changes, and the degree of missimulation which can result from the performance of a particular, less-than optimum test. Conclusions are drawn on the advantages and disadvantages derived from the use of input spectra adjustment methods and lower support structure simulations. Test guidelines were also developed for planning and performing a launch acoustic-environmental test. Author

N75-17412# Engins Matra, Velizy (France).
TD-1A: EVALUATION OF ATTITUDE CONTROL SYSTEM FROM TELEMETRY DATA, VOLUME 1 Final Report
Jul. 1974 337 p 2 Vol.
(Contracts ESTEC-1968; ESTEC-1945/73)
(ESRO-CR(P)-554) Avail: NTIS HC $9.50

A detailed evaluation of the TD1A satellite attitude control system and components, from telemetry data, has been carried out. The principles used to analyze different problems and the cases where these principles have been applied are summarized. The details of analysis of each typical set of TM data are given as well as the mathematical models used to analyze them. The TM data processing methods and techniques are also discussed. For Volume 2, see N75-16615. ESRO

N75-17413# European Space Research Organization, Paris (France).
A PROCEDURE FOR THE ANALYTICAL SOLUTION OF THE NONLINEAR AERO-ELASTIC GALLOPING STABILITY PROBLEM
H. Foersching et al Dec. 1974 53 p refs Transl. into ENGLISH of ein Verfahren zur Anal. Loesung des nichtlinearen aeroelastischen Galloping-Stabilitaetsprobl., DLR-FB-73-18, DFVLR, 1973 (ESRO-TT-120; DLR-FB-73-18) Avail: NTIS HC $4.25; DFVLR, Porz, West Ger. 12 DM

An approximate procedure for the analytical solution of the nonlinear motion differential equation for the aeroelastic galloping stability problem is presented. The nonlinear aerodynamic term is approximated by means of a polygonal function, and the stability equation is solved analytically by the phase-plane method. The details for the procedure involved in the solution are described and explained by means of a typical example. Author (ESRO)

N75-17414# Army Foreign Science and Technology Center, Charlottesville, Va.
SELF-GUIDANCE SYSTEM OF AN ANTIAIRCRAFT GUIDED MISSILE
F. Neupokoev 21 Jun. 1974 14 p Transl. into ENGLISH from the book "Strelba Zenitnymi Raketami" Moscow, Voyenizdat, 1970 p 151-162
(AD-A000247; FSTC-HT-23-0680-74) Avail: NTIS CSCL 15/3

The report describes the homing system of an antiaircraft guided missile. The system can be an active one or a semiactive one; in an active system, the energy source, illuminating the target and the signal receiver is in the missile itself. In a semiactive one, the electromagnetic energy for illuminating the target is not contained in the missile. GRA

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-17415*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
MEASUREMENT OF SPUTTERED EFFLUX FROM 5-, 8-, AND 30-cm DIAMETER MERCURY ION THRUSTERS
A. J. Weigand and M. J. Mirtich 1975 19 p refs Presented at 11th Elec. Propulsion Conf., New Orleans, 19-21 Mar. 1975; Sponsored by AIAA
(NASA-TM-X-71665; E-8250) Avail: NTIS HC $3.25 CSCL 21C

A study was undertaken to investigate the sputtered efflux from 5-, 8-, and 30-cm diameter mercury ion thrusters. Quartz crystal microbalances and fused silica samples were used to analyze the sputtered flux. Spectral transmittance measurements and spectrographic analysis of the samples were made after they were exposed to different thruster effluence by operating the thrusters at various conditions and durations of time. These measurements were used to locate the source of the efflux and determine its accumulated effect at various locations near the thruster. Comparisons of in situ and ex situ transmittance measurements of samples exposed to thruster efflux are also presented. Author

N75-17416# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DESIGN DEVELOPED UNDER THE SUPERVISION OF S. P. KOROLEV
18 Oct. 1974 14 p Transl. into ENGLISH from the book "Pionery Raketnoi Tekhniki: Vetchinkin, Glushko, Korolei, Tikhonravov, Izbrannye Trudy" Moscow, Izd vo Nauka, 1972 p 734-743
(AD-A000441; FTD-HC-23-1682-74) Avail: NTIS CSCL 01/3

Described are designs executed by S. P. Korolev and under his supervision, specifically for installation of rocket engines. The airframe designs developed by Korolev are not discussed. GRA

N75-17417# Alabama Univ., University. Bureau of Engineering Research.
AUTOMATED EVALUATION OF INTERCEPTOR ROCKET MOTOR DESIGNS UNDER COMBINED OPERATIONAL AND NUCLEAR EFFECTS LOADS Final Report, 26 Mar. - 31 Dec. 1973
Thomas L. Cost and George E. Weeks Jul. 1974 66 p refs (Contract DAAH01-73-C-0667)
(AD-A000915; BER-176-97) Avail: NTIS CSCL 21/8

Some solid rocket motors must be designed to withstand loads induced by an encounter with a nuclear weapon detonation while subjected to conventional operational loads. A system has been developed which permits a rapid, preliminary evaluation of solid rocket motors under combined loads in an automated fashion. The operational loads considered are pressurization and acceleration, and the nuclear load component considered is that due to in-depth radiant energy absorption. The system incorporates two finite element structural analysis codes, AMG074 for the operational loads analysis and AMG063 for the stress wave analysis, and a photon energy deposition code, KNISH, for predicting the energy absorption and subsequent stress loadings. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N75-17418# Argonne National Lab., Ill. Chemistry Div.
[RESAERCH PROGRESS IN CHEMISTRY, INCLUDING STUDIES ON NUCLEAR STRUCTURE, CHEMICAL BEHAVIOR, RADIATION EFFECTS, AND ENERGY TRANSFER BEHAVIOR, RADIATION EFFECTS, AND ENERGY TRANSFER] Annual Report, Jul. 1972 - Jun. 1973
D. F. Peppard, ed. Apr. 1974 176 p refs
(Contract W-31-109-eng-38)
(ANL-8096) Avail: NTIS HC $7.00

The nuclear structure and chemical behavior of the heavy elements, interactions of radiation with matter, fundamentals of energy transfer at the atomic and molecular level, and behavior of materials of construction when subjected to extremely high temperatures and/or to bombardment by high-energy particles were the focal points for this research. Other important fields of study center on the primary photosynthetic process, the mutual separation of metals, the inorganic chemistry of elements in unusual states of oxidation, the structures and physical properties of nonstoichiometric compounds possessing special magnetic properties, the composition and origin of extraterrestrial matter, the determination of the age of artifacts, and the application of radioactive isotopes in medical diagnoses. Author

N75-17419# California Univ., Santa Barbara. Deptj of Physics.
COLLECTIVE PHYSICAL PROPERTIES OF FINITE CONDENSED MATTER Final Report
1974 14 p refs
(Grant AF-AFOSR-2007-71)
(AD-A000392) Avail: NTIS CSCL 20/12

This project concerned properties of condensed matter in which one or more dimensions were reduced. Thin films and surfaces form what is called two-dimensional systems; metal whiskers and organic crystal in which the molecules are strongly coupled along only one direction form one-dimensional systems; finally, in this language, small particles and atomic aggregates form zero-dimensional systems. GRA

N75-17420# California Univ., Los Angeles. Dept. of Chemistry.
STRUCTURES OF METALLOCARBORANES. 5: SYNTHESIS AND CRYSTAL AND MOLECULAR STRUCTURE OF THE CLOSO 20-ELECTRON BIMETALLOCARBORANE 1,6-BIS (ETA-CYCLOPENTADIENYL) 1,6-DIFERRA 2,3-DICARBA-CLOSO-DECARBORANE(8), 1-6-(ETA-C5H5) 2-1, 6, 2, 3-Fe2C 2B6H8 Interim Report
Kenneth P. Callahan, William J. Evans, Frederick Lo, Y., Charles E. Strouse, and M. Frederick Hawthorne 13 Nov. 1974 44 p refs
(Contract N00014-69-A-0200-4019; NR Proj. 053-481)
(AD-A001379; TR-79) Avail: NTIS CSCL 07/3

The polyhedral expansion of 4,5-C2B7H9 with ferrous chloride and sodium cyclopentadienide produced a new ferracarborane formulated as (C5H5)2-Fe2C2B6H8, which exists in paramagentic and diamagnetic forms. The crystal and molecular structure of the diamagnetic form has been determined by a three-dimensional x-ray diffraction study at - 160C. The compound crystallized in the monoclinic centrosymmetric space group P2(1)/n. The polyhedral geometry observed in this compound is a new 10-vertex species which is derived from a bicapped square antiprism. Structures of the title compound and of its cobalt analog are discussed in terms of the bonding theory of metallocarboranes. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N75-17421# Sandia Labs., Albuquerque, N.Mex.
J-INTEGRAL AS A FAILURE CRITERION FOR A BORSIC-Al COMPOSITE
W. R. Hoover and R. E. Allred Aug. 1974 32 p refs
(Contract AT(29-1)-789)
(SAND-74-0193) Avail: NTIS HC $3.75

The fracture toughness behavior of a unidirectional Borsic-Al composite was examined in three-point bending at three different loading rates (0.00033, 20, and 130 in./s). The load-deflection traces indicated that crack pop-in occurred prior to maximum load at all three testing speeds. The fracture toughness was observed to increase with increased loading rate. To determine if the apparent strain-rate sensitive fracture was due to the nonlinear behavior, Rice's J-integral was evaluated over a wide range of crack lengths under static loading conditions. The critical J values varied continuously with crack length; hence the J-integral was inappropriate as a failure criterion. However, a similar but theoretically different parameter, the critical potential energy release rate, L sub c, was found to be constant over a wide range of crack lengths. In addition, L sub c was found to be constant to within + or - 4% over the loading rate range tested. Thus the L sub c approach may be an effective failure criterion for unidirectional Borsic-Al composites in three-point bending. Author (NSA)

N75-17422# Army Foreign Science and Technology Center, Charlottesville, Va.
A METHOD FOR DETERMINING THE COMPRESSIVE STRENGTH OF FIREPROOF PRODUCTS IN COMPRESSION
14 Jun. 1974 7 p Transl. into ENGLISH from Russ. State Std., GOST-4071-69 (USSR)
(AD-A000207; FSTC-HT-23-1401-73) Avail: NTIS HC $3.25 CSCL 11/2

Method for testing the compressive strength of fireproof products is studied. The testing and measurement must be carried out according to various State Standards. Testing is done at room temperature and failure to observe any procedures is punishable by law. GRA

N75-17423# Picatinny Arsenal, Dover, N.J.
INITIAL FEASIBILITY STUDY EMPLOYING HOLOGRAPHIC VIBRATIONAL ANALYSIS TO LOCATE NONBONDS IN THICK CERAMIC TO FIBERGLASS COMPOSITE
Modesto J. Barbarisi and Brian R. Chisolm Sep. 1974 22 p refs
(AD-A000647; PA-TR-4675) Avail: NTIS CSCL 11/4

The report describes a new nondestructive testing technique by which vibrational analysis and holography complement each other to yield information and results not obtainable by other means. Nonbonds in a composite structure of ceramic and fiberglass, undetectable by other methods employing acoustics, were made clearly visible by the holographic vibrational analysis described. Author (GRA)

N75-17424# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
EXTENDED HEATING ABLATION OF CARBON PHENOLIC AND SILICA PHENOLIC Final Technical Report, Sep. 1972 - Jan. 1973
R. W. Farmer Sep. 1974 41 p refs
(AF Proj. 7340)
(AD-A000416; AFML-TR-74-45) Avail: NTIS CSCL 11/4

An analysis was made of experimental and analytical investigations of the ablation of carbon phenolic and silica phenolic composites under extended heating conditions. Specimens of up to 8.75 sq. in. in area and instrumented with indepth thermocouples were characterized under stepwise pulses of either five minutes (2 steps) or up to 1.4 minutes (to 5 steps) in duration using two air arc heaters. The nominal peak heat load was 35,000 Btu/sq ft. Internal and surface temperatures, recession rates, and recession patterns in the residual char were not anomalous for the two step, low shear (to 2.5 lb/sq ft) runs. Charring-ablator theory indepth and surface temperature responses agreed well with experimental results for a carbon phenolic. For the five step condition with a moderate peak shear (30 lb/sq ft) there was cine film evidence of micromechanical surface removal at late times. Micromechanical effects, by difference, were further consistent with theory. Reliable composite properties were found to be necessary to accurately model extended heating ablation. Author (GRA)

N75-17425# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
MEASUREMENT OF ADVANCED COMPOSITION MATERI-

ALS SHIELDING EFFECTIVENESS Final Report, Mar. 1972 - Jan. 1973
D. G. Kim, G. A. DuBro, and R. C. Beavin Jun. 1974 45 p refs
(AF Proj. 1987)
(AD-A000414; AFFDL-TR-30-74) Avail: NTIS CSCL 11/4

The work was conducted to define the shielding characteristics of advanced composite materials. The report discusses the experimental evaluation of the shielding effectiveness of advanced boron and graphite composites with and without conductive layers at low-to-moderate frequencies. GRA

N75-17426# Purdue Univ., Lafayette, Ind. Composite Materials Lab.
EFFECTS OF PHYSICAL AND GEOMETRICAL NONLINEARITIES ON THE DYNAMIC BEHAVIOR OF LAMINATED COMPOSITES Final Report, 16 Jun. 1961 - 15 Jun. 1974
C. T. Sun and S. L. Koh Sep. 1974 176 p refs
(Contract DAHC04-71-C-0020)
(AD-A000907; ARO-9380.7-E) Avail: NTIS CSCL 11/4

The physical and geometrical nonlinearities in laminated composites are investigated separately. The formulations are within the framework of small deformations. Nonlinear stress-strain relations are derived based on the assumption that the matrix materials yield the nonlinear behavior while the fibers remain linearly elastic. Due to the physical nonlinearity, the nature of the wave motions in the composites are found to be substantially different from that of the linear composites. The geometrical nonlinearity considered in this report results from the large deflection of laminated plates. The equations of motion for the laminated plates are derived following the von Karman's large deflection for plates. The dynamical conditions on the shock and acceleration waves are consistently developed from the three-dimensional conditions. The corresponding equations of motion as well as the dynamical conditions for incremental waves superposed on deformed laminates are also presented. Effects of the large amplitude and the initial deformation on harmonic waves as well as wave front propagations are studied. GRA

N75-17427# Nuclear Metals, Inc., West Concord, Mass.
FIBER STRENGTHENED SUPERALLOYS Final Report
Gerald I. Friedman Jan. 1974 36 p refs
(Contract DAAG46-72-C-0251; DA Proj. 1T1-62105-AH-84)
(AD-A000919; NM-3520; AMMRC-CTR-74-6) Avail: NTIS

Discontinous fibers of Mo were incorporated in matrices of nickel base superalloys INCO 625, INCO 713 LC, IN-100, and TDNiCr by coextrusion of blended powders. An elevated temperature stress rupture test showed that fiber strengthening was obtained only in INCO 625 in the temperature region of 1500 to 1700 F. GRA

N75-17428# Southern Methodist Univ., Dallas, Tex. Dept. of Civil and Mechanical Engineering.
MECHANICS OF COMPOSITE MATERIALS WITH DIFFERENT MODULI IN TENSION AND COMPRESSION Interim Scientific Report
Robert M. Jones Jul. 1974 48 p refs
(Grant AF-AFOSR-2532-73; AF Proj. 9782)
(AD-A000024; AFOSR-74-1597TR) Avail: NTIS CSCL 11/4

Composite materials have been used for several years in thermal protection systems such as reentry vehicle nosetips and heatshields as well as in more conventional aerospace structures such as laminated wings and stabilizers in the latest aircraft. Many composite materials, e.g., ATJ-S graphite, carbon/carbon, and graphite/epoxy, exhibit different strength and stiffness behavior in tension and compression. The moduli differences range from 20% for ATJ-S graphite to between 100% and 400% for carbon/carbon. The principal objective of the research was to analyze the behavior of solid bodies with different elastic moduli in tension and compression as well as the behavior of laminated plates and shells that have different elastic moduli in tension and compression and lamination asymmetries. (Modified author abstract) GRA

N75-17429# Purdue Univ., Lafayette, Ind. Properties Research Lab.
THERMAL TRANSPORT IN REFRACTORY CARBIDES Final Report
Raymond E. Taylor, Kuang-Ying Wu, and Edmund K. Storms 30 Jul. 1974 89 p refs Prepared in cooperation with Los Alamos Scientific Lab.
(Grant AF-AFOSR-2375-72; AF Proj. 9750)
(AD-A000027; AFOSR-74-1517TR) Avail: NTIS CSCL 11/2

Thermal energy transport mechanisms in titanium carbide and zirconium carbide have been studied. Several compositions of vanadium carbide alloyed with titanium carbide were used. The electronic component of the thermal conductivity exceeded the values computed using the classical value for L in the Wiedemann-Franz-Lorenz law. The results could be explained by allowing L to increase with increasing temperature. In the case of zirconium carbide, samples with various degrees of carbon vacancies were used. There was a remarkable increase in the electron and phonon contributions to the thermal conductivity as the carbon vacancy concentration was decreased near the stoichiometric composition. The temperature dependency of the thermal conductivity could be explained in terms of a substantial residual resistivity and an L which increased with increasing temperature, and that was somewhat dependent on the carbon vacancy concentration. (Modified author abstract) GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N75-17430# Northeastern Univ., Boston, Mass. Dept. of Physics.
SPONTANEOUS MAGNETIZATION OF THE THREE-SPIN ISING MODEL ON THE UNION JACK LATTICE
F. Y. Wu Jan. 1975 10 p refs Sponsored by NSF
(NUB-2244) Avail: NTIS HC $3.25

The spontaneous magnetization of the Ising model with pure three-spin interactions on a Union Jack lattice was obtained in terms of the magnetic and the ferroelectric orderings of the eight-vertex model. Magnetizations of the two sublattices are found to possess different critical exponents. Author

N75-17431*# Scientific Translation Service, Santa Barbara, Calif.
ON THE BEHAVIOR OF MAGNESIUM IONS IN SILICATE GLASSES
A. Din and H. W. Hennicke Washington NASA Feb. 1975 12 p refs Transl. into ENGLISH from Glastech. Ber., (Frankfurt am Main), v. 47, Part 1, Jan. 1974 p 14-16
(Contract NASw-2483)
(NASA-TT-F-16197) Avail: NTIS HC $3.25 CSCL 07D

Density and viscosity measurements were performed on silicate glasses at both high and low temperatures. The molar volume and the viscosity data show the magnesium ions in the glass systems studied occur in tetrahedral and octahedral configurations at low and high temperatures, respectively. Author

N75-17432*# Kanner (Leo) Associates, Redwood City, Calif.
ORGANOMETALLIC ELECTROLYTE OF HIGH CONDUCTIVITY FOR CATHODIC DEPOSITION
Karl Zeigler, Herbert Lehmkuhl, and Wolfram Grimme Washington NASA Feb. 1975 19 p Transl. into ENGLISH from West German Patent no. 1,146,258 (30 Jun. 1961) 19 p
(Contract NASw-2483)
(NASA-TT-F-16177) Avail: NTIS HC $3.25 CSCL 07D

A high conductivity organometallic electrolyte was investigated for the cathodic deposition of Na. It consists of a mixture of NaAlMe 4 (30 - 75 mole %) and corresponding alkoxy-complex compound. Author

N75-17433# National Aerospace Lab., Tokyo (Japan).
AN INVESTIGATION OF THE DIFFUSION FLAME SURROUNDING A SIMULATED LIQUID FUEL DROPLET BY GAS

ANALYSIS AND OPTICAL INTERFEROMETRY
Takashi Tamaru, Said I. Abdel-Khalik, and M. M. El-Wakil 1974 20 p refs In JAPANESE; ENGLISH summary
(NAL-TR-374) Avail: NTIS HC $3.25

The structure of the diffusion flame surrounding a simulated burning drop of n-heptane was investigated by the use of gas chromatography and optical interferometry. The cylindrical drop model was examined while burning at atmospheric pressure in a uniform air flow field at several air velocities. The composition and temperature profiles along several radial lines around the drop were determined. It was found that the flame structure varies markedly around the drop and that the air velocity has a large effect on the temperature profiles. The composition and temperature profiles were used to evaluate the mass and heat-flux distributions around the drop. The non-dimensional burning rate of the model corresponds to that of the sphere model of the burning droplet measured by other investigators. The optical interferometry is proved useful and practical to investigate the heat transfer around a simulated burning droplet. Author

N75-17434*# Colorado State Univ., Fort Collins.
SUPPRESSION OF NONLINEAR OSCILLATIONS IN COMBUSTORS WITH PARTIAL LENGTH ACOUSTIC LINERS Contractor Report, 1 Dec. 1970 - 30 Nov. 1974
W. R. Espander, C. E. Mitchell, and M. R. Baer Feb. 1975 131 p refs
(Grant NGR-06-002-095)
(NASA-CR-134767) Avail: NTIS HC $5.75 CSCL 21B

An analytical model is formulated for a three-dimensional nonlinear stability problem in a rocket motor combustion chamber. The chamber is modeled as a right circular cylinder with a short (multi-orifice) nozzle, and an acoustic linear covering an arbitrary portion of the cylindrical periphery. The combustion is concentrated at the injector and the gas flow field is characterized by a mean Mach number. The unsteady combustion processes are formulated using the Crocco time lag model. The resulting equations are solved using a Green's function method combined with numerical evaluation techniques. The influence of acoustic liners on the nonlinear waveforms is predicted. Nonlinear stability limits and regions where triggering is possible are also predicted for both lined and unlined combustors in terms of the combustion parameters. Author

N75-17435# Hanford Engineering Development Lab., Richland, Wash.
SODIUM-CONCRETE REACTION TESTS
J. A. Hassberger, R. K. Hilliard, and L. D. Muhlestein Jun. 1974 58 p refs
(Contract AT(45-1)-2170)
(HEDL-TME-74-36) Avail: NTIS HC $4.25

Five small scale tests were made with the objective of measuring the rate of reaction between liquid sodium and concrete for a limited number of conditions. Two types of concrete were used: conventional (SiO2) and high density (magnetite). The reaction with 4-in. diameter horizontal surfaces and 10-in. diameter vertical surfaces was studied by heating the sodium pool while it was in direct contact with the concrete surface and measuring the depth of penetration of sodium into the concrete after cooling. Magnetite concrete was penetrated at about 1-in. per hour; conventional concrete at about 0.5-in. per hour. Cracking occurred with the 10-in. vertical surface interface specimen, but not with the 4-in. horizontal interface specimens. The heat generation rate was estimated at 10,000 Btu/h-ft for magnetite concrete at 1200 F, with a probable error of + or - 50%. The heat of reaction was estimated at 700 + or - 350 Btu per lb of magnetite concrete. Author (NSA)

N75-17436# California Univ., Berkeley. Lawrence Radiation Lab.
MULTIPLE-BEAM SPECTROSCOPY
P. S. Rostler May 1974 284 p refs
(Contract W-7405-eng-48)
(LBL-2014) Avail: NTIS HC $8.75

A spectroscopic technique is described which provides spatially localized information about fine scale fluctuations in the density of light sources within a self-luminous plasma. The light accepted by a two-beam system is described in terms of spatial Fourier transforms of the field. The information given by a scattering experiment is obtained from spectroscopic measurements upon the light emitted by the plasma itself. Fluctuations in a laboratory plasma were observed. The results obtained show a multiple-beam spectrometer can be used for plasma diagnostics. The theory developed is extended to include the use of higher order optical correlation measurements to detect higher order correlations in the source, the use of several optical frequencies to observe high-frequency phenomena within a plasma, and the use of a broad portion of the optical spectrum to make one observation more efficiently. Author (NSA)

N75-17437# Oak Ridge Operations Office, Tenn.
PREDICTION OF OSMOTIC AND ACTIVITY COEFFICIENTS FOR ELECTROLYTE MIXTURES AT ELEVATED TEMPERATURES
M. H. Lietzke and R. W. Stoughton Sep. 1974 17 p
(Contract W-7405-eng-26)
(ORNL-4999) Avail: NTIS HC $3.25

Simple expressions developed for predicting properties such as osmotic and activity coefficients for electrolyte mixtures at 25 C are demonstrated to function well at elevated temperatures. It is concluded that the techniques used in the calculations presented could be used to predict osmotic and activity coefficient behavior in as yet unstudied systems, such as the solutions of geothermal interest. Author (NSA)

N75-17438# Los Alamos Scientific Lab., N.Mex.
ELECTRONIC STRUCTURE AND OPTICAL PROPERTIES OF SOME FIRST ROW TRANSITION METAL OXYHALIDES
J. P. Jasinski (Virginia Univ.) Jun. 1974 205 p refs
(Contract W-7405-eng-36)
(LA-5637-T) Avail: NTIS HC $7.25

A molecular orbital calculation was performed on two closed shell, d (0), molecules in C sub 2v symmetry (CrO2F2 and CrO2Cl2) and two closed shell, d(0), molecules in C sub 3v symmetry (MnO3F and MnO3Cl) using the SCF-X alpha - SW method. The theoretical results are related to the parent tetrahedral ions (CrO4(21) and MnO4(-) and to the gas phase optical absorption spectrum of each of the molecules of interest. It was found in the molecules C sub 3v symmetry that the ordering of ground state electronic energy levels can be grouped into a tetrahedral format nearly identical to that for the parent MnO4(-) ion. Electronic orbital transitions and excited state assignments were made with the aid of vibrational data for the absorption bands in the visible and near ultraviolet regions. Descent in symmetry results in only a minor perturbation of the electronic absorption spectrum of MnO4(-). The effects of the halide charge transfer first became significant with the second electronic orbital transition from the highest filled bonding p orbitals to the central metal d orbitals. Author (NSA)

N75-17439# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
GRAIN BOUNDARY SLIDING AND STRUCTURE Progress Report, 1 Dec. 1973 - 30 Nov. 1974
C. Y. Li 1 Sep. 1974 15 p
(Contract AT(11-1)-2172)
(COO-2172-7) Avail: NTIS HC $3.25

Research devoted to development of concepts and methods for characterization of polycrystalline solids is reported. Results of investigations are presented on work hardening, plastic equation of state, creep, and grain boundary sliding in 316 stainless steel. NSA

N75-17440# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics.
HEMATITE PHASE DIAGRAM IN A MAGNETIC FIELD. 1: LOW-TEMPERATURE MODIFICATION
M. Balanda and V. V. Nitts 1974 20 p refs In RUSSIAN
(JINR-P14-7974) Avail: AEC Depository Libraries HC $4.00

Thermodynamic consideration is made of the hematite crystal behavior in the external magnetic field at the temperature below the Morin point. On the basis of experimental data analysis it is shown that in the phase diagram there is a line of tricritical and that of critical points. Author (NSA)

N75-17441# California Univ., Livermore. Lawrence Livermore Lab.

INVESTIGATION OF POLYION-SMALL ION ELECTROSTATIC INTERACTION EFFECTS IN POLYELECTROLYTE SOLUTIONS Ph.D. Thesis

D. L. Ermak 6 Sep. 1974 190 p refs
(Contract W-7405-eng-48)
(UCRL-51636) Avail: NTIS HC $7.00

The effects of the polyion-small ion electrostatic interaction upon the dynamic and equilibrium properties of the ions in polyelectrolyte solutions at thermodynamic equilibrium were studied. A computer technique was developed for simulating the motion of the ions through the solution. The computer results were different from those predicted by the self-consistent field theory of Stephen and a comparison of the two is presented. The average electrostatic energy of each ion species and the small ion distribution function relative to a central polyion was calculated in each computer run. Results were compared with those of the Debye-Huckel theory for polyions at zero concentration. The computer simulation technique developed was extended to include the shielded polyion-polyion electrostatic interaction. In contrast to the polyion-small ion interaction, the polyion-polyion interaction was found to decrease the polyion diffusion coefficient. Author (NSA)

N75-17442# California Univ., Livermore. Lawrence Livermore Lab.

MAGNETIC ORDER IN CERTAIN ALKALI AMPHIBOLES, A MOSSBAUER INVESTIGATION

R. J. Borg and I. Y. Borg 21 Aug. 1974 14 p refs Presented at Intern. Conf. on the Appl. of the Mossbauer Effect, Bendor, France, 2-6 Sep. 1974 Revised Submitted for publication Sponsored by AEC
(UCRL-75499-Rev-1; Conf-740905-2) Avail: NTIS HC $3.25

The appearance of magnetic hyperfine splitting (mhfs) was used to determine the magnetic ordering temperature for a few selected alkali amphiboles. This class of minerals has the monoclinic crystal structure and the general formula (Na,Ca)2-3 (Fe(+2), Fe(+3), Mg, Al)5 Si8O22(OH, F)2. The iron can occupy three distinct crystallographic sites, yet the mhfs collapses with increasing temperature in the manner of less complex magnetic substances. In spite of the overall complexity, the much greater mhfs of Fe(+3) easily separates lines 1 and 6 from all resonant absorption due to Fe(+2). Thus, relevant Moessbauer and magnetic parameters can be determined. The stacking sequence formed by the three sites is a one-dimensional chain parallel to the c axis. Each chain is separated from adjacent chains by linked SiO4 tetrahedra. Thus, direct exchange can only occur within the chain, and a type of super-exchange must exist between chains. Author (NSA)

N75-17443# Interuniversitair Reactor Instituut, Delft (Netherlands).

SZILARD-CHALMERS REACTIONS IN THE HEXAHALOCOMPLEXES OF IRIDIUM. PART 2: DEPENDENCE OF RECOIL PRODUCT SPECTRA ON THE COMPOSITION OF THE COMPLEXES

W. J. VanOoij and J. P. W. Houtman 1974 18 p refs Submitted for publication
(IRI-133-74-08-Pt-2) Avail: NTIS HC $3.25

Twenty three hexahalocomplexes of tri- and tetravalent iridium were irradiated with thermal neutrons at -196C, and their aqueous solutions were analyzed for the 192Ir-labelled recoil products, utilizing paper electrophoresis. The recoil product spectrum, consisting predominantly of monomeric and dimeric aquahalocomplexes, was found to depend strongly on the composition of the target material. Water of hydration as well as small cations resulted in low retention values. Anhydrous compounds of Ir (IV) yielded relatively large amounts of a polymeric product P with the tentative composition H5(192Ir(V)(Ir(IV)C16)5). ESRO

N75-17444# Interuniversitair Reactor Instituut, Delft (Netherlands).

SZILARD-CHALMERS REACTIONS IN THE HEXAHALOCOMPLEXES OF IRIDIUM. PART 3: ANNEALING EFFECTS

W. J. VanOoij and J. P. W. Houtman 1974 19 p refs Submitted for publication
(IRI-133-74-09-Pt-3) Avail: NTIS HC $3.25

Thermal and radiation annealing were studied in several hexahalocomplexes of tri- and tetravalent iridium. Moreover, transfer annealing experiments after recrystallization of irradiated samples were carried out. In all irradiated compounds a post-irradiation thermal treatment results in an increase of the retention. Heating of recrystallized irradiated samples produces effects which are similar to the thermal annealing effects. Hydration or dehydration of irradiated complexes affects the product spectra but does not result in an increase of the retention. The results are discussed in terms of a model. Author (ESRO)

N75-17445# Yale Univ., New Haven, Conn. Dept. of Physics.

THE MEASUREMENT OF ORIENTATIONAL ORDER IN CHOLESTERIC LIQUID CRYSTALS

Peter J. Collings, Susan I. Goss, and James R. McColl Aug. 1974 16 p refs
(Contract N00014-67-A-0097-0013; NR Proj. 017-651)
(AD-785281; TR-10) Avail: NTIS CSCL 07/4

The relationship between second rank tensor anisotropy and the orientational order in a cholesteric liquid crystal is derived. Experimental results on a mixture of cholesteryl chloride and p-azoxyanisole confirm this relationship and also provide an explanation of the dipolar NMR lineshape of a sample in the cholesteric phase. Author (GRA)

N75-17446# Frankford Arsenal, Philadelphia, Pa.

SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF SILICON, IRON, AND ALUMINUM IN NITROCELLULOSE-BASE PROPELLANTS Final Technical Test

George Norwitz and Herman Gordon Aug. 1974 16 p refs
(AD-787305; FA-TT-74006) Avail: NTIS CSCL 07/2

Methods are proposed for the spectrophotometric determination of trace amounts of silicon, iron, and aluminum in nitrocellulose-base propellants. Results are given for silicon, iron, and aluminum in twenty propellant samples. (Modified author abstract) GRA

N75-17447# Tyco Labs., Inc., Waltham, Mass. Saphikon Div.

SPINEL RIBBON Final Report, Mar. 1972 - Jul. 1974

A. D. Morrison, H. E. LaBelle, Jr., G. F. Hurley, S. M. Smith, and D. J. Meuse Jul. 1974 113 p refs
(Contract DAAB05-72-C-5841)
(AD-786605; E-426-F) Avail: NTIS CSCL 20/2

The prototype system for the production process for manufacturing single crystal spinel ribbon (1 in. wide by 0.0 in. thick) from the melt was built and now produces as scheduled. Analytical studies using an X-ray spectrometer provided data on variations of spinel composition with time at melt. Spinel seeds, both in ribbon and rod from, have been grown as properly oriented single crystal material. A large number of crystal growth runs were carried out during this program which served to establish the validity of our overall approach and showed that the only unexpected problem area was a discoloration of the grown ribbons. The significant problem areas which were addressed included discoloration of the ribbon attributed to molybdenum contamination, and the occurrence of large imperfections in the microstructure which was eventually shown to be traceable to the starting material. (Modified author abstract) GRA

N75-17448# Army Foreign Science and Technology Center, Charlottesville, Va.

A BINARY OUTPUT ELEMENT FOR LOGICAL AND SWITCHING DEVICES ON FERROMAGNETIC SINGLE CRYSTALS

M. A. Boyarchenkov, Ya. Sh. Palagashvili, Yu. D. Rosenthal, and O. K. Khomeriki 21 Feb. 1974 10 p refs Transl. into ENGLISH from Avtomat. Telemekh. (USSR), no. 3, 1973 p 185-187
(AD-A000226; FSTC-HT-23-1823-73) Avail: NTIS CSCL 09/2

The article describes uses for devices, based on Hall's domain detector, in read-out computer techniques. The galvanomagnetic method is most widely used because of its simplicity and ease of adaptability. Results of testing showed that these devices give readings which are not affected by the field of displacement, and can be used at high temperatures. GRA

N75-17449# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.

ABSORPTION AND COLLISIONAL REDISTRIBUTION OF MOLECULAR ENERGY REVEALED BY DOUBLE RESONANCE SPECTROSCOPY/MOLECULAR DEACTIVATION PROCESSES IN VISIBLE CHEMICAL LASER SYSTEMS Final Report

J. I. Steinfeld 1974 24 p refs
(Grant AF-AFOSR-2032-71; AF Proj. 9538)
(AD-A000682; AFOSR-74-1735TR) Avail: NTIS CSCL 07/4

Two major areas of investigation were comprehended by this research program. The first was an investigation of vibrational relaxation properties of small polyatomic molecules, primarily by the techniques of infrared-infrared and infrared-microwave double resonance spectroscopy. At a later stage, the emphasis was shifted to deactivation processes involving electronically excited states of small molecules having potential applications to visible chemical laser systems. Results are summarized. A report on saturation of infrared absorption in PFS, BCls, and propynal is included. GRA

N75-17450# Army Foreign Science and Technology Center, Charlottesville, Va.

COMBUSTION OF MIXTURES OF MAGNESIUM WITH LIGHT METAL CARBONATES

A. V. Vasilev, V. V. Gorbunov, V. G. Khromov, and A. A. Shidlovskii 7 Jan. 1974 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol. (USSR), v. 14, no. 2, 1971 p 183-185
(AD-A000209; FSTC-HT-23-1480-73) Avail: NTIS CSCL 21/2

Experimentally obtained thermochemical data and combustion product composition of mixtures of magnesium with Li, Na, K, Mg and Ca carbonates, as well as with solid CO2, are presented. Data on combustion rates at various pressures also are presented. Combustion rates vs. pressure and combustion product composition apparently are determined by the thermal stability of the carbonates used. GRA

N75-17451# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

OBSERVATIONS OF MECHANICALLY POLISHED KCl SURFACES USING SCANNING ELECTRON MICROSCOPY Physical Sciences Research Papers

Charles V. Collins and Norman E. Pickering 7 Aug. 1974 13 p refs
(AF Proj. 5620)
(AD-A000020; AFCRL-TR-74-0373; AFCRL-PSRP-599) Avail: NTIS CSCL 20/5

The surfaces of polished KCl samples, prepared by different mechanical polishing techniques, were examined using a scanning electron microscope and electron microprobe. An evaluation of the general quality of the polish and of the chemical composition of foreign matter found on the surface was completed. A qualitative analysis using an energy dispersive system was performed on all samples. Quantitative microanalysis was also completed. The results of these analyses and their implications are discussed in this report. The need for laser window materials with good optical and mechanical properties motivated this study. (Modified author abstract) GRA

N75-17452# Army Foreign Science and Technology Center, Charlottesville, Va.

THE EFFECT OF CERTAIN ADDITIVES ON CRITICAL DIAMETER AND COMBUSTION RATES OF MIXTURES OF ALUMINUM WITH GELLED WATER

A. V. Vasilev, V. V. Gorbunov, and A. A. Shidlovskii 7 Jan. 1974 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Khim. Khim. Tekhnol., (USSR), v. 13, no. 3, 1970 p 318-321
(AD-A000210; FSTC-HT-23-1509-73) Avail: NTIS CSCL 21/2

Critical diameter and combustion rate at atmospheric pressure, combustion rate vs. pressure in the 20-100 atm range, and completeness of oxidation of aluminum at pressures of up to 60-100 atm were determined for 50:50 Al:H2O) and stoichiometric Mg:H2O mixtures, with and without addition of 1-5% KF, NaF, LiF, AlF3 and NaOH. Graphs of the resulting data are presented. It is concluded that these additives increase Al - H2O ignitibility and decrease critical diameter, that NaF and KF have a greater effect on combustion rate than the others and that the improved ignition and combustion result from the action of boiling water solutions of NaF and KF in destruction of the oxide films. GRA

N75-17453# Hawaii Univ., Honolulu. Dept of Physics and Astronomy.

LOW ENERGY X-RAY AND ELECTRON PHYSICS FOR MATERIALS ANALYSIS Final Report, 1 Dec. 1971 - 30 Jun. 1974

Burton L. Henke and Murray A. Tester Oct. 1974 18 p
(Grant AF-AFOSR-2174-72; AF Proj. 9751)
(AD-A000698; AFOSR-74-1782TR) Avail: NTIS CSCL 07/4

The program of this grant period has been directed to research, independent and collaborative in the application of low energy X-ray and electron physics to the following areas: (1) surface state, molecular and solid state analysis by ultrasoft X-ray spectroscopy; (2) development of methods for quantitative photoelectron spectroscopic analysis for surface structure and chemistry; and (3) the development of techniques for high temperature plasma diagnostics by low energy X-ray spectroscopy. Activities, some results, and techniques and equipment are briefly described. (Modified author abstract) GRA

N75-17454# Naval Air Systems Command, Washington, D.C.

ENERGY CONVERSION. 1: NON-PROPULSIVE ASPECTS Research Program Review

Mar. 1974 166 p refs
(AD-A000077) Avail: NTIS CSCL 21/2

The papers included here were presented at the review of Energy Conversion (non-propulsive aspects) programs which was held 26-27 March 1974 at the University of Denver, Phipps Memorial Conference Center. Sessions were devoted to Fuels and to Pyrotechnics. Papers are entitled: Aluminum soap hydrocarbon gel structures; Mechanisms of flame inhibition by chemical agents; High-density and low-viscosity missile fuels; Infrared spectral distribution of high temperature sources; Pyrotechnic flare spectroscopy; Alkali metal flame emitters; A mathematical model of flare plume combustion and radiation; Research on endothermic binders; Precursor smoke formulations; Chemiluminescence for the determination of the kinetics and mechanism of jet fuel oxidative degradation. GRA

N75-17455# Ohio State Univ. Research Foundation, Columbus.

SUPERSONIC COMBUSTION Interim Report, Apr. 1973 - Mar. 1974

Rudolph Edse Aug. 1974 18 p
(Grant AF-AFOSR-1902-70; AF Proj. 9711; OSURF Proj. 3641)
(AD-A000457; OSURF-3641-1; AFOSR-74-1594TR) Avail: NTIS CSCL 21/2

The report contains research results obtained from experimental and theoretical studies of subsonic and supersonic combustion phenomena pertaining to ramjet-combustors. A theoretical model has been developed for predicting the transition of one-dimensional deflagration waves to stable detonation waves. According to preliminary results deflagrations passing through hydrogen-bromine mixtures do not lead to detonation waves. However, experiments have shown that Chapman-Jouguet detonation waves are obtained in these mixtures when ignition occurs by shock waves. Induction distances predicted by the theory for hydrogen-oxygen mixtures agree with experimentally observed values. The detonation speeds and pressures of a 1:1 (by volume) hydrogen-bromine mixture were calculated and measured experimentally in shock tubes. The laminar flame speed of a hydrogen-air mixture was determined for initial gas temperatures ranging from 300 to 784. (Modified author abstract) GRA

N75-17456# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.

SUMMARY REPORT OF WORKSHOP ON ENERGY RELATED BASIC COMBUSTION RESEARCH

Irvin Glassman and William A. Sirignano Aug. 1974 35 p Workshop held at Princeton, N. J., 19-21 Jun. 1974
(Grant NSF GP-44105)
(PB-236714/2; AMS-1177) Avail: NTIS HC $3.75 CSCL 21B

A workshop on energy related basic research in combustion was held a Princeton University on June 19-21, 1974. The discussions covered four main topics: Practical combustion devices, heterogeneous combustion, homogeneous combustion and combustive kinetics. The workshop identified the following research topics as being of most important: turbulent reacting flows, instrumentation, hydrocarbon reaction kinetics, nitric oxide formation from organic bound nitrogen, burning of heavy and emulsified fuels, flame behavior near the fuel lean and rich extinction and ignition limits, spray combustion, coal reactions and ash, and conversion of fuel form. Each of these topics is discussed in some detail. The above research areas were not priority ordered. GRA

N75-17457# National Research Council, Washington, D.C. Committee on Chemical Crystallography.
CRITICAL EVALUATION OF CHEMICAL AND PHYSICAL STRUCTURAL INFORMATION
David Lide, Jr. and Martin Paul Jun. 1974 635 p refs Conference held at Hanover, N. H., 24-29 Jun. 1973
(Contract NSF C-310)
(PB-236884/3; ISBN-0-309-02146-4) Avail: NTIS MF $2.25; HC $26.25 Avail. National Academy of Sciences Printing and Publishing Office, 2101 Constitution Ave., N. W., Washington, D. C. 20418 CSCL 07D

The reviews are primarily concerned with the critical evaluation of parameters that describe the geometric arrangement of atoms in a free molecule or crystal, vibrational force fields, and the electronic charge distribution as derived by spectroscopic, resonance, diffraction, theoretical, and other methods of investigation. The broad scope of this valuable reference work will be of interest to those concerned with the problems of extracting and communicating reliable, accurate, and self-consistent structural information from the data of chemistry and physics. GRA

N75-17458# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
IGNITION AND BURNING OF MAGNESIUM PARTICLE
G. K. Ezhovskii, A. S. Mochalova, E. S. Ozerov, and A. A. Yurinov 13 Nov. 1974 16 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" Moscow, Izd vo Nauka, 1972 p 234-240
(AD-A001157; FTD-HT-23-1880-74) Avail: NTIS CSCL 21/2

An experimental study was conducted with small (up to 250 micron) and large (0.5 to 1.5 millimeters) spherical particles of magnesium. The small particles were introduced into a hot gas flow with an oxidizer by means of a vibrating feed. The large particles were suspended in the flow from a holder with a loop or fork of tungsten wire measuring 50 microns in diameter. The hot particles were recorded by means of constantly moving photographic film and a disc shutter or were registered by a photoelectric multiplier and oscillograph. The combustion products analyzed by microscopic examination. The ignition limits for the particles are plotted in the form of graphs. A numerical analysis of the changes in ignition characteristics with variations in the ambient conditions is provided. Author

N75-17459# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
IGNITION OF ALUMINUM WIRE
A. G. Merzhanov, Yu. M. Grigorev, and L. B. Mashkinov 13 Nov. 1974 13 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" Moscow, Izd vo Nauka, 1972 p 245-249
(AD-A001159; FTD-HT-23-1882-74) Avail: NTIS CSCL 21/2

Developed in the work is an electrothermographic approach to studying the ignition of metals, which is based on the programmed heating of a thin metal filament in a flow of an oxidizer gas. The given method was used to conduct a study on the ignition of aluminum wire in a flow of pure oxygen at atmospheric pressure. GRA

N75-17460# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATING COMPOSITION AND ELECTRICAL CONDUCTIVITY OF HETEROGENEOUS COMBUSTION PRODUCTS OF CHEMICAL FUELS
V. E. Alemasov, A. F. Dregalin, and A. S. Cherenkov 12 Nov. 1974 12 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" Moscow, Izd vo Nauka, 1972 p 430-434
(AD-A001160; FTD-HT-23-1938-74) Avail: NTIS CSCL 21/2

In order to calculate the electrophysical properties of the heterogeneous combustion products of chemical fuels the composition of neutral and charged substances in both the gaseous and condensed states must first be reliably determined. Strict determination of the composition of ionized heterogeneous products requires joint solution of the equations of chemical and ionization equilibrium for all substances found in different phase states. To determine the composition of ionized heterogeneous products in this study the method, developed by the authors, of jointly solving the solution to the equations of the chemical and ionized equilibriums for gaseous and condensed substances was used. A modified method calculating the composition has been developed for the case where the substance in the condensed state does not have a gas phase or for the case where the degree of dissociation of the gas phase is insignificant. GRA

N75-17461# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A KINETIC ANALYSIS OF A REACTION BETWEEN THE SOLID AND GAS (IN AN EXAMPLE OF HYDROGENATION OF IRON CARBIDE)
A. Ya. Rozovskii and V. D. Stytsenko 30 Oct. 1974 22 p refs Transl. into ENGLISH from the book "Problemy Kinetiki i Kataliza. 15: Mekhanizm i Kinetika Geterogennykh Reaktsii" Moscow, Izd vo Nauka, 1973 p 191-199
(FTD Proj. T74-04-08)
(AD-A000369; FTD-MT-24-1768-74) Avail: NTIS CSCL 07/4

Using the example of hydrogenation reaction of iron carbide the authors illustrated the general principles of the kinetic analysis of topochemical reactions and show its possible application in the selection of the mechanism for a topochemical reaction and determination of kinetic constants for this reaction. GRA

N75-17462# Marquardt Corp., Van Nuys, Calif.
REPORT ON THE DEVELOPMENT AND TESTING OF A GAS GENERATOR OPERATING ON BENZENE AND NITROUS OXIDE Final Report, 23 Jun. 1972 - 28 Jun. 1974
Aug. 1974 88 p refs
(Contract N60921-72-C-0369)
(AD-A001070; MR-S-1303) Avail: NTIS CSCL 14/2

The report describes a three phase program to investigate the combustion of benzene and nitrous oxide, the products of such combustion being diluted with gaseous nitrogen. The objective of this process was to provide a soot-free exhaust gas of specified composition and temperature from a combustion system operating at defined mass flow and pressure levels. Phase I included the design and test of a pilot model combustor system operating at 1.0 pounds per second total mass flow and nominal 100 psia combustion chamber pressure. Tests were conducted to investigate various combustor liner configurations, propellant injection systems, ignition, and process flow systems for incorporation into a full scale system. Phase II consisted of the design and fabrication of a full scale combustion system, with remote controls, rated at 10 pps mass flow at 588 psia combustion chamber pressure. Phase III consisted of installation and demonstration testing of the full scale system at the Air Force-Marquardt Jet Laboratory. System calibration tests were conducted plus a series of 34 combustion tests. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N75-17463 British Library Lending Div., Boston Spa (England).
THE RESIDUAL STRESSES IN WIRES PRODUCED IN ROLLER AND MONOLITHIC DRAW PLATES
I. K. Nikolaev, I. L. Perlin, B. B. Diomidov, E. F. Popov, R. B. Gutnov, and L. Sh. Pisarevskii 1974 9 p refs Transl. into ENGLISH from Stal. (USSR), no. 4, 1974 p 369-371
(BLL-M-21977-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Drawing in roller draw plates (four roller passes) is characterized by much lower external friction forces than conventional drawing in monolithic draw plates. A batch of 6.0 mm diameter 50 steel wire rods was drawn in two passes using both methods with a 5.0 to 3.95 mm procedure, i.e. reductions of 32% and 57.5%. The residual tensile stresses were determined from Heine's formula using continuous electrolytic corrosion of the specimen surface on a special TsNIIChM unit. The change in its length was recorded every fifteen minutes. It was found that the specimens from the roller draw plates have lower residual stresses (particularly in the 3.95 mm finished size), a condition which should prove favorable for reducing crack formation. Author

N75-17464 British Library Lending Div., Boston Spa (England).
INVESTIGATION OF MUTUAL DIFFUSION IN THE COPPER-NICKEL SYSTEM
E. A. Balakir, Yu. P. Zotov, E. B. Malysheva, V. I. Panchishnyi, B. N. Podgorskii, and V. V. Sharapov 1974 26 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 7, 1974 p 22-25
(BLL-M-25037-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Mutual diffusion was studied in the copper-nickel and nickel low-alloy copper alloys. The concentration dependence of the coefficient of mutual diffusion, activation energy, and the pre-exponential multiplier was determined in the range 650-950 C. A linear correlation coefficient of mutual diffusion was established with a fusibility diagram in the copper-nickel system. The data obtained point to a vacancy mechanism of diffusion in the investigated system. Author

N75-17465 British Library Lending Div., Boston Spa (England).
SPECIFIC ELECTRICAL RESISTANCE OF THE TERNARY MOLTEN Pb-Bi-Cd SYSTEM
B. A. Tkachenko and E. I. Kharkov 1974 23 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 7, 1974 p 18-21
(BLL-M-25036-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Experimental data were obtained for the temperature and concentration relationships of the specific electrical resistance in the ternary molten Pb-Bi-Cd system. The experimental results are discussed within the framework of the Ziman theory. Author

N75-17466 British Library Lending Div., Boston Spa (England).
THE PROPERTIES OF INTERMEDIATE LAYERS DURING THE HEAT TREATMENT OF Al-Cu BIMETAL
W. R. Rjabow and A. W. Losowskaja 1974 15 p Transl. into ENGLISH from Schweisstechnik (Berlin), v. 22, 1972 p 250-253
(BLL-M-23625-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The kinetic laws that govern the formation and growth of intermediate layers under heat treatment are described. The strength of the bimetals depends upon the thickness of the intermediate layers. The chief phases occurring under heating are the CuAl2, and on the outside, the y-phase. In welding the bimetals with Al-filler, satisfactory mechanical properties could be achieved with a tulip-shaped seam preparation. Author

N75-17467 British Library Lending Div., Boston Spa (England).
UTILIZING FUEL MORE EFFICIENTLY IN REHEATING AND HEAT TREATMENT FURNACES
V. N. Grigorev and V. L. Gusovskii 1974 10 p Transl. into ENGLISH from Stal (USSR), v. 3, 1974 p 274-276
(BLL-M-21957-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The proceedings of a conference on supplying natural gas to ferrous metallurgy undertakings are summarized. Also discussed were problems involved in more efficient use of gas in rolling mill furnaces. N.E.R.

N75-17468 British Library Lending Div., Boston Spa (England).
QUANTITATIVE ANALYSIS OF PHOSPHOROUS IN STEEL AND CASTINGS BY ATOMIC ABSORPTION SPECTROMETRY
Angel M. Baialardo and A. Gomez Coedo 7 Nov. 1974 7 p Transl. into ENGLISH from Rev. Metal CENIM (Argentina), v. 9, 1973 p 35-38
(BLL-RR-Trans-9249-(8660.5)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

An indirect method is proposed for the quantitative analysis of phosphorus in steels and castings. The method consists of developing a phosphomolybdic complex, extracting the phosphomolybdic acid with Isobutyl Acetate, and returning it to the aqueous phase with dilute Hydrochloric Acid. The molybdenum content is determined in this medium by atomic absorption, and the phosphorus percentage in the sample calculated on the basis of molybdenum present. Author

N75-17469 British Library Lending Div., Boston Spa (England).
PRECIPITATES IN HIGH-CARBON CHROMIUM STEEL
H. Diergarten, K. H. Moehler, and L. Weigel 27 Feb. 1974 17 p refs Transl. into ENGLISH from Arch. Eisenhuetten. (West Germany), v. 41, no. 2, Feb. 1970 p 179-184
(BLL-CE-Trans-6227-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

X-ray examinations, electron-microscopic irradiation, and fine range diffraction analyses were used for examining thin sections of a steel containing about 1.45% C and 1.4% Cr after martensitic hardening and tempering at 40 to 100 C. This was done to determine the precipitation phases (carbon and carbides) occurring during tempering. Their morphological and crystallographic features are presented. Author

N75-17470 British Library Lending Div., Boston Spa (England).
QUANTITATIVE ESTIMATION OF THE RESISTANCE OF AUSTENITIC STAINLESS STEELS TO STRESS CORROSION
V. V. Gerasimov 29 Aug. 1974 5 p refs Transl. into ENGLISH from Trans. Acad. of Sci. (USSR), v. 212, no. 6, 1973 p 1404-1406
(BLL-Dounreay-Tran-662(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Forecasting the working life of energy plant with regard to stress corrosion is discussed a long with crack formation in a metal with planar pile-ups of dislocations. Author

N75-17471 British Library Lending Div., Boston Spa (England).
CHANGE IN SURFACE STRUCTURE DURING HIGH TEMPERATURE CREEP DEFORMATION
Fujimura Yoshinori, Kondo Katsutoshi, and Onda Takeshi 7 Nov. 1974 25 p refs Transl. into ENGLISH from J. Jap. Inst. Metals (Japan), v. 37, 1973 p 764
(BLL-RR-Trans-8940-(8660.5)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

Short creep tests were conducted on three kinds of single phase test material at high temperatures and under reduced pressure. An optical microscope was used to observe the structure revealed by thermal etching. Results indicate that with highly pure nickel and in oxygen-free copper, sub-grain boundaries become observable comparatively early and sub-crystal grains are formed at the end of the transitional creep. The grains are found to be affected more by stress than by temperature.
Author

N75-17472 British Library Lending Div., Boston Spa (England).
HIGH-MELTING METALS AND METAL COMPOUNDS
H. Haag [1974] 24 p refs Transl. into ENGLISH from Metall. (West Germany), v. 28, no. 7, 1974 p 725-730
(BLL-RR-Trans-9284-(8660.5)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

High-melting metals such as tungsten, molybdenum, niobium, tantalum, their high-melting compounds such as carbides, nitrides, borides, and silicides, and the latter type of compound with other metals such as chromium, vanadium, and the rare earth metals are discussed. The techniques of production, special properties, and application of high-melting materials were investigated. Author

N75-17473*# Scientific Translation Service, Santa Barbara, Calif.
EFFECT OF ALUMINUM ON THE PROPERTIES OF CHROMIUM-NICKEL STEEL
K. V. Gorev, L. I. Shvedov, S. K. Livshits, and Z. D. Raylenko Washington NASA Feb. 1975 8 p Transl. into ENGLISH from Vestn. Akad. Nauk Belaruskay SSR, Seryya Fiz.-Tekhn. Navuk

(USSR), no. 2, 1969 p 100-102
(Contract NASw-2483)
(NASA-TT-F-16160) Avail: NTIS HC $3.25 CSCL 11F

A systematic study was made of the properties of chromium-nickel steel containing various amounts of aluminum. The experimental conditions are described. It is found that an aluminum alloy increases creep resistance and thermal resistance. Author

N75-17474*# Scientific Translation Service, Santa Barbara, Calif.
EFFECT OF SILICON, MOLYBDENUM, AND COPPER ON THE PITTING CORROSION OF STEEL 00Kh18N20
F. N. Tavadze, N. D. Tomashev, S. N. Mandzhgaladze, L. A. Akhvlediani, V. F. Tavadze, O. N. Markovaa, and G. P. Chernova Washington NASA 25 Feb. 1975 8 p refs Transl. into ENGLISH from Soobshch. Akad. Nauk Gruz. SSR (Georgian), v. 61, no. 1, 1971 p 133-136
(Contract NASw-2483)
(NASA-TT-F-16158) Avail: NTIS HC $3.25 CSCL 11F

The tendency of steel 00Kh18N20 (18 Gr 20 Ni) alloyed by silicon, molybdenum, and copper, to pitting corrosion was investigated as a function of the content of alloying elements. Alloying by copper decreases the resistance of steel to pitting corrosion, but as a result of complex alloying (by copper, silicon, and molybdenum), the steel shows high resistance to this type of corrosion. It has been established that it is more effective to alloy steel 00Kh18N20 by 1% rather than by 2% of silicon.
Author

N75-17475# Royal Aircraft Establishment, Farnborough (England).
MECHANICAL PROPERTIES RESISTANCE TO CORROSION, AND THE USES OF TITANIUM IN THE CHEMICAL INDUSTRY
B. DeGelas, L. Seraphin, R. Tricot, and R. Castro Nov. 1974 25 p refs Transl. into ENGLISH from Rev. Met. (Paris), v. 71, no. 1, 1974 p 75-85
(RAE-Lib-Trans-1808; BR44992) Avail: NTIS HC $3.25

The physical and mechanical properties of titanium and its alloys are discussed along with their corrosion resistance, special types of corrosion, and characteristic uses of titanium in corrosive media. It was found that the mechanical properties of titanium and its alloys are comparable to those of the stainless steel, and that they have good fabrication properties combined with an exceptionally high corrosion resistance. M.J.S.

N75-17476*# Tyco Labs., Inc., Waltham, Mass.
EUTECTIC SUPERALLOYS BY EDGE-DEFINED, FILM-FED GROWTH
G. F. Hurley Jan. 1975 83 p refs
(Contract NAS3-16790)
(NASA-CR-134756; C-325) Avail: NTIS HC $4.75 CSCL 11F

The feasibility of producing directionally solidified eutectic alloy composites by edge-defined, film-fed growth (EFG) was carried out. The three eutectic alloys which were investigated were gamma + delta, gamma/gamma prime + delta, and a Co-base TaC alloy containing Cr and Ni. Investigations into the compatibility and wettability of these metals with various carbides, borides, nitrides, and oxides disclosed that compounds with the largest (negative) heats of formation were most stable but poorest wetting. Nitrides and carbides had suitable stability and low contact angles but capillary rise was observed only with carbides. Oxides would not give capillary rise but would probably fulfill the other wetting requirements of EFG. Tantalum carbide was selected for most of the experimental portion of the program based on its exhibiting spontaneous capillary rise and satisfactory slow rate of degradation in the liquid metals. Samples of all three alloys were grown by EFG with the major experimental effort restricted to gamma + delta and gamma/gamma prime + delta alloys. In the standard, uncooled EFG apparatus, the thermal gradient was inferred from the growth speed and was 150 to 200 C/cm. This value may be compared to typical gradients of less than 100 C/cm normally achieved in a standard Bridgman-type apparatus. When a stream of helium was directed against the side of the bar during growth, the gradient was found to improve to about 250 C/cm. In comparison, a theoretical gradient of 700 C/cm should be possible under ideal conditions, without the use of chills. Methods for optimizing the gradient in EFG are discussed, and should allow attainment of close to the theoretical for a particular configuration. Author

N75-17477*# Martin Marietta Corp., Denver, Colo.
PROPERTIES OF CRYOGENICALLY WORKED METALS Final Report, Aug. 1973 - Aug. 1974
Fred R. Schwartzberg and Ted F. Kiefer Feb. 1975 44 p
(Contract NAS3-17776)
(NASA-CR-134757) Avail: NTIS HC $3.75 CSCL 11F

A program was conducted to determine whether the mechanical properties of cryogenically worked 17-7PH stainless steel are suitable for service from ambient to cryogenic temperatures. It was determined that the stress corrosion resistance of the cryo-worked material is quite adequate for structural service. The tensile properties and fracture toughness at room temperature were comparable to titanium alloy 6Al-4V. However, at cryogenic temperatures, the properties were not sufficient to recommend consideration for structural service.
Author

N75-17478*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Minerals Engineering.
A STUDY OF THE DIFFUSIONAL BEHAVIOR OF A TWO-PHASE METAL MATRIX COMPOSITE EXPOSED TO A HIGH TEMPERATURE ENVIRONMENT Final Report
D. R. Tenney [1974] 54 p refs
(Grant NGR-47-004-097)
(NASA-CR-136751) Avail: NTIS HC $4.25 CSCL 11F

The progress of diffusion-controlled filament-matrix interaction in a metal matrix composite where the filaments and matrix comprise a two-phase binary alloy system was studied by mathematically modeling compositional changes resulting from prolonged elevated temperature exposure. The analysis treats a finite, diffusion-controlled, two-phase moving-interface problem by means of a variable-grid finite-difference technique. The Ni-W system was selected as an example system. Modeling was carried out for the 1000 to 1200 C temperature range for unidirectional composites containing from 6 to 40 volume percent tungsten filaments in a Ni matrix. The results are displayed to show both the change in filament diameter and matrix composition as a function of exposure time. Compositional profiles produced between first and second nearest neighbor filaments were calculated by superposition of finite-difference solutions of the diffusion equations. Author

N75-17479# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
FRACTOGRAPHY OBSERVATIONS OF FATIGUE FAILURES IN TITANIUM ALLOYS
Albert Tobin Feb. 1975 17 p refs
(RM-594) Avail: NTIS HC $3.25

Fractographic examinations were made on two titanium alloys. The alloys were subjected to different thermomechanical histories and failed in a constant amplitude fatigue test. Results show no specific correlation between the chemistry of the alloy and failure mode; a clear-cut microstructural dependence of local crack advance was noted. Alpha grain boundaries and alpha-beta interfaces were delineated by the presence of secondary cracks showing their relative weakness. Fatigue striations were not observed in the lower range of crack growth rates but dominated the fracture appearance at higher crack growth rates. The fast fracture region was dominated by dimpled rupture. The fracture appearance of these alloys is explained in terms of the localized cyclically work-hardened zone just ahead of the advancing fatigue crack. Author

N75-17480# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Material- und Festkoerperforschung.
CREEP BEHAVIOR OF TWO AUSTENITIC STAINLESS STEELS UNDER INCREASING LOAD
L. Schaefer and K. D. Closs Apr. 1974 34 p refs In GERMAN; ENGLISH summary
(KFK-1963) Avail: AEC Depository Libraries HC $4.75

Creep tests under linear increasing stress have been performed on unirradiated tubular specimens under uniaxial and biaxial stress conditions and on unirradiated and irradiated sheet tensile specimens. Three methods are evaluated for describing the creep curves under increasing stress. The three methods are: a graphic

representation, an analysis of the creep rate as a function of stress and stress rate, and the application of the time-fraction rule for creep strength curves. The advantages and disadvantages of the three methods are discussed. Author (NSA)

N75-17481# Japan Atomic Energy Research Inst., Tokyo. Div. of Reactor Safety

CORROSION OF AUSTENITIC STAINLESS STEELS IN LIQUID LITHIUM

Isao Nihei, Isao Sumiya, Yoshio Fakaya, and Yasaburo Yamazaki May 1974 32 p refs In JAPANESE; ENGLISH summary (JAERI-M-5683) Avail: AEC Depository Libraries

A series of tests on fusion reactor materials is in progress. Preliminary lithium corrosion tests on austenitic stainless steels are shown. Specimens were tested at temperatures up to 600 C in a natural lithium circulation corrosion testing apparatus. The testing conditions are: apparatus material, 304 SS; test specimens, 304 SS, and 316 SS; maximum temperatures, 400, 500, and 600 C; lithium temperature difference, 100 C; lithium flow rate, 200 cc/min; and testing period, 1100 h. The following results have been obtained: (1) The corrosion is general corrosion. (2) The corrosion rate at 600 C is 11.6 microns/year for 304 SS and 11.9 microns/year for 316 SS. NSA

N75-17482# Ames Lab., Iowa.

STRAIN DISTRIBUTION IN HOT ROLLED ALUMINUM BY PHOTOPLASTIC ANALYSIS M.S. Thesis - Iowa State Univ.

A. K. Oyinlola Oct. 1974 75 p refs (Contract W-7405-eng-82) (IS-T-640) Avail: NTIS HC $4.25

A previously developed photomechanic material, Laminac, which excellently simulates the behavior of aluminum in tension was investigated intensively as a possible modeling material for hot-rolled aluminum billets. Photoplasticity techniques combined with the Moire method were used to study the behavior of the Laminac mixture in compression. Photoplastic analysis revealed that a Laminac mixture of 60% flexible and 40% rigid resins, compressed or rolled at 40 C, showed the phenomenon of double bulging that was observed in hot-rolled aluminum billets. The potentiality of the 60:40 Laminac mixture as a possible simulating material at 40 C is further enhanced by the fact that the true stress-true strain curves of cylindrical samples compressed at 40 C correlated very well with true stress-true strain of identical cylindrical samples of aluminum compressed at 300, 425, and 500 C. Author (NSA)

N75-17483# Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Inst. fuer Metallurgie.

PRECIPITATION OF COPPER IN ALUMINUM-SILVER CRYSTALS

E. M. Hoerl Jul. 1974 20 p refs (SGAE-2302; ME-58/74) Avail: NTIS HC $3.25

Precipitation of copper in aluminium-silver crystals was observed by an electron microscopy technique. By annihilation of the precipitates at high temperatures an activation energy for the dominating diffusion process was calculated from the velocity of the motion of the edges of the precipitates. This energy amounts to 1.45 + or - 0.08 eV and represents approximately the height of the potential wall an atom has to overcome in order to leave a precipitated layer. Author (NSA)

N75-17484# Battelle-Northwest, Richland, Wash.

INVESTIGATIONS OF THE MICROSTRUCTURE OF HEAVY ION BOMBARDED NICKEL

J. L. Brimhal Jul. 1974 29 p refs (Contract AT(45-1)-1830) (BNWL-1839) Avail: NTIS HC $3.25

The microstructure of pure nickel bombarded with Ni ions in the temperature range 180 to 450 C was studied. The defect structure consists of small dislocation loops and stacking fault tetrahedra (SFT) which are of vacancy type. Large dislocation loops and dislocation fragments comprise the interstitial type damage. The small loops and SFT formed a fcc defect lattice similar to the void lattice. The preference of the vacancies to form dislocation type defects rather than voids can be related to the high displacement rate during ion bombardment. Several explanations are given for the defect lattice although no one explanation is completely adequate. Author (NSA)

N75-17485# Danish Atomic Energy Commission, Risoe.

ADDITIVE STRENGTH CONTRIBUTIONS

V. Andreasen Apr. 1974 95 p refs In DANISH (RISO-M-1714) Avail: AEC Depository Libraries HC $7.75

A review of theories and models proposed for dispersion hardening, solid solution hardening, grain boundary hardening, and workhardening of dispersion hardening alloys is given. The movement of a dislocation line through an array of different kinds of obstacles was examined in order to investigate the interaction between different hardening mechanisms. Experimentally the plastic deformation at room temperature of Cu, Cu - Ag, Cu - Al2O3, and Cu - Ag - Al2O3 alloys was examined as a function of composition and volume fraction. The alloys were in the form of polycrystals and single crystals, and the single crystals were deformed in the (112)-direction. The solid solution hardening is shown to be additive to the other strengthening mechanisms. In polycrystals an interaction between grain boundary hardening and dispersion hardening was found and this interaction can be determined by computer simulation. The Hall-Petch relation is not obeyed in this case. Author (NSA)

N75-17486# Royal Aircraft Establishment, Farnborough (England). Structures Dept.

THE INFLUENCE OF A SINGLE APPLICATION OF HEAT ON FATIGUE CRACK PROPAGATION IN DTD 5070A (RR58) ALUMINIUM ALLOY SHEET

F. E. Kiddle London Aeron. Res. Council 1974 35 p refs Supersedes RAE-TR-72108; ARC-34272 (ARC-CP-1272; RAE-TR-72108; ARC-34274) Avail: NTIS HC $3.75; HMSO 60p; PHI $2.65

Tests were conducted to investigate the influence of a single application of heat on fatigue crack propagation in DTD 5070A aluminum alloy sheet. Two possible effects of heat were investigated: the effect of heat on the overall crack propagation characteristics, and local effects on the plastically worked material ahead of the crack tip. It is shown that the effect of heating was a slight slowing down of subsequent crack propagation attributed to a change in material properties which modifies the overall crack propagation characteristics. Although no short term effect was detected that could be attributed to a local change in the conditions at the crack tip, under aircraft service conditions, heating occurs many times, and the cumulative effect of even small changes in crack propagation rate could be significant. Author (ESRO)

N75-17487# Royal Aircraft Establishment, Farnborough (England). Structures Dept.

FATIGUE TESTS ON PLAIN SPECIMENS OF TITANIUM 6Al-4V UNDER VARIABLE AMPLITUDE LOADING

A. W. Cardrick and B. H. E. Perrett London Aeron. Res. Council 1974 13 p refs Supersedes RAE-TR-73029; ARC-34609 (ARC-CP-1276; RAE-TR-73029; ARC-34609) Avail: NTIS HC $3.25; HMSO 25 p; PHI $1.25

Plain specimens extracted from annealed and stress relieved titanium 6Al-4V forged bar of 330mm x 57mm section were tested at zero mean stress, under constant amplitude and narrow band random loading. A comparison of the fatigue performance under random loading with that predicted from the constant amplitude data using Miner's rule gives a value for sigma n/N of approximately 0.3 for endurances in the region of 10 to the 7th power cycles. This falls within the band of values between 0.15 and 0.6 commonly obtained for aluminum alloys and mild steel tested under similar conditions. Author (ESRO)

N75-17488# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

THE PROPAGATION OF FATIGUE CRACKS EMANATING FROM HOLES

D. Broek Nov. 1972 25 p refs Sponsored by the Directorate of Mater. Air, RNLAF (NLR-TR-72134-U) Avail: NTIS HC $3.25

The growth of fatigue cracks emanating from holes was studied employing alclad sheet specimens. Both symmetric and asymmetric cases were considered. Crack growth is compatible with the stress intensity factor derived by Bowie and also with

the stress intensity factor derived from the simple engineering approach that considers the hole part of the crack. ESRO

N75-17489# Westinghouse Research Labs., Pittsburgh, Pa.
NONELASTIC DEFORMATION OF POLYCRYSTALS WITH A LIQUID BOUNDARY PHASE
F. F. Lange 23 Sep. 1974 43 p refs
(Contract N00014-74-C-0284; ARPA Order 2697)
(AD-A000434; Rept-74-9D4-POWDR-R1; TR-1) Avail: NTIS CSCL 11/6

A conceptual view is taken to understand the deformation behavior of a polycrystal with a liquid (or a quasi-elastic) boundary phase. The analysis is based on the theories of liquid adhesives, the fracture of liquids and the concepts of fracture mechanics. It is shown that boundary separation rather than boundary sliding is the step that controls the deformation rate. Using this principal result, it is shown that the deformation behavior of a polycrystalline material with a viscous boundary phase is controlled by the flow characteristics, the volume content of the boundary phase and the microstructure features of the polycrystal (viz., voids, solid inclusions and cracks). Polycrystalline materials with a viscous boundary phase will exhibit a much greater rate of deformation in tension than in compression. Author (GRA)

N75-17490# Watervliet Arsenal, N.Y.
K RESULTS AND COMPARISONS FOR A PROPOSED STANDARD C-SPECIMEN
J. H. Underwood and D. P. Kendale Sep. 1974 25 p refs
(AD-A000681; WVT-TR-747041) Avail: NTIS CSCL 11/6

Stress intensity factor data from a boundary value collocation method are used to determine the K calibration for a proposed standard C-shaped specimen for fracture toughness testing. The standard specimen can be readily used with hollow cylinders which have outer-to-inner diameter ratios between 1.2 and 3.0. The K calibration is described in a polynomial form similar to that used with the ASTM standard compact specimen but with an additional term dependent on diameter ratio. Stress intensity factor results from a standard C-specimen with shallow cracks are compared with an analysis based upon the elastic solution for a curved beam under remote bending. K results for mid-depth cracks in the standard C-specimen are compared with compact specimen results and with results from a recently proposed round specimen similar to the compact specimen. Some suggestions are given and anticipated problems are discussed related to testing with the proposed standard specimen. Author (GRA)

N75-17491# Paris Univ. (France). Lab. d'Optique des Solides.
METALLURGY, STRUCTURE, CHARACTERIZATION AND OPTICAL INVESTIGATION OF Ag-Cu SOLID SOLUTIONS IN THE WHOLE CONCENTRATION RANGE Final Report, Jan. - Dec. 1973
J. Rivory, M. L. Theye, and F. Abeles Jun. 1974 65 p refs
(Contract DAJA37-73-C-1807)
(AD-786669) Avail: NTIS CSCL 11/6

Thin films of Ag-Cu alloys over the whole concentration range have been prepared by co-evaporation of the two metals under different conditions. Their crystallographic structure has been thoroughly investigated and the conditions for obtaining metastable solid solutions have been specified. The optical properties of these films have been determined between 0.5 and 6 eV from reflectance and transmittance measurements by two complementary methods. They are analyzed in relation with the electronic structure of the alloys. In particular, the data relative to dilute Ag-Cu alloys has been interpreted in terms of the virtual-bound state model; the position and width of the Cu d-states have been determined. Clustering and phase-separation effects have also been investigated. Author (GRA)

N75-17492# Army Foreign Science and Technology Center, Charlottesville, Va.
EFFECT OF HEAT TREATMENT ON PROPERTIES OF ALUMINUM AND ITS ALLOYS REINFORCED WITH CONTINUOUS STEEL FIBERS
E. S. Atroshchenko, N. N. Kazak, V. A. Kotov, A. N. Kriventsov, and V. S. Sedykh 16 Jan. 1974 5 p ref Transl. into ENGLISH from the book "Tekhnolog. Mashinostroen. Tr." Volograd, Politek Hnicheskii Inst., 1970 p 130-133
(AD-A000222; FSTC-HT-23-1752-73) Avail: NTIS CSCL 11/4

A study was made of the effect that tempering temperature has on plastic properties and specific strength for composite specimens made of Al and its alloys with steel fiber, prepared by welding, explosion, and subsequent cold drawing. It is shown that the strength of the reinforced material rises somewhat after heatings at 100-150C compared with the strength obtained after welding and rolling. Heating of reinforced material at more elevated temperatures (200C and higher) leads to a reduction in its strength owing to softening of the maxtrix metal and fibers. GRA

N75-17493# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
INFLUENCE OF STRESS ON PRECIPITATION AND COARSENING IN ALLOYS Final Report
Stephen M. Copley Sep. 1974 20 p refs
(Grant AF-AFOSR-2087-71; AF Proj. 9761)
(AD-A000373; AFOSR-74-1615TR) Avail: NTIS HC CSCL 11/6

Scanning and transmission electron microscopy of precipitate morphologies of normalized and stress-aged Udimet 700 and Ni/9 Al (wt pct) alloys were studied. In both alloys, rods and plates are formed by a coarsening process involving shape change and agglomeration. All experimental observations, the stress aging behavior of Mar-M200, the NiAl-Cr eutectic and the various omega containing titanium-base alloys can be understood on the basis that the morphology forms, and minimizes a free energy including interfacial energy, residual strain energy and interaction energy terms. A method of estimating the residual strain energy and interaction energy of an infinite plate, infinite rod and cuboidal composite has been developed. A theory of diffusional creep has been developed for binary metallic solid-solutions subjected to a uniform uniaxial state of stress. Several predictions of the theory have been confirmed in Ni/Cr and Ni/W solid solutions. GRA

N75-17494# Connecticut Univ., Storrs. Dept. of Metallurgy.
ON LARGE-SCALE PLASTICITY EFFECTS IN FATIGUE CRACK PROPAGATION Interim Report
A. J. McEvilly, D. Beukelmann, and K. Tanaka (Kyoto Univ.) Aug. 1974 17 p refs
(Grant AF-AFOSR-2703-74; AF Proj. 9782)
(AD-A000541; UC-MET-2-1974; AFOSR-74-1967TR) Avail: NTIS CSCL 11/6

The correlation between the rate of fatigue crack growth and the stress-intensity factor seems to be well established in the linear elastic range where the size of the plastic zone is small relative to other critical dimensions. However, for large scale yielding in the elastic-plastic region as well as for fully plastic behavior, crack growth relationships have as yet not been as well established. It is the purpose of the present paper to explore possible analytical expressions for fatigue crack growth for such cases involving large-scale plasticity effects. The approach is based upon the use of an assumed relationship between the crack opening displacement as given by Bilby, Cottrell and Swinden and the rate of fatigue crack growth. GRA

N75-17495# Connecticut Univ., Storrs. Dept. of Metallurgy.
FRACTURE BY FATIGUE Interim Report
A. J. McEvilly May 1974 33 p refs
(Grant AF-AFOSR-2703-74; AF Proj. 9782)
(AD-A000474; UC-MET-1-1974; AFOSR-74-1600TR) Avail: NTIS CSCL 11/6

In this presentation a review of the current status of fatigue is given from the mechanistic as well as the design viewpoints. Areas in need of further understanding such as corrosion fatigue, creep-fatigue, and fatigue under variable amplitude loading are also considered. GRA

N75-17496# Army Materials and Mechanics Research Center, Watertown, Mass.
THE TOUGHNESS OF HIGH HARDNESS LAMINAR COMPOSITE STEEL AS INFLUENCED BY SPECIMEN AND CRACK ORIENTATION Final Report
Peter T. Lum, Richard Chait, and Charles F. Hickey, Jr. Aug. 1974 15 p

(AD-A000712; AMMRC-TR-74-18) Avail: NTIS CSCL 11/6

The purpose of the present paper is to extend the study of high hardness laminar composite steel and establish the orientation influence using static and dynamic toughness measurements. The toughness behavior of high hardness laminar composite steel (high carbon, approximately Rc 60, hard layer metallurgically bonded to a medium carbon, approximately Rc 50, softer layer) was investigated. The effort focused on the effect of test temperature, specimen orientation, and crack location on toughness. Charpy V-notch specimens with the notch extending through both the hard and soft layers were tested over a series of temperatures to provide transition curves for both the longitudinal and transverse directions. These transition curves are compared to those obtained from specimens that were surface notched on either the hard or soft side. By precracking similar oriented specimens, information on the fracture toughness was obtained over approximately the same range. These data show the effect of the interface between the hard and soft layers on the various toughness parameters. Lastly, stress corrosion cracking was investigated and K sub ISCC values provided. (Modified author abstract) GRA

N75-17497# Hydronautics, Inc., Laurel, Md.

THE STRAIN RATE DEPENDENCE OF THREE HIGH STRENGTH NAVAL ALLOYS Technical Report, 1 Feb. 1971 - 31 Mar. 1974

Andrew F. Conn, S. Lee Rudy, and Stephen C. Howard Jun. 1974 121 p refs

(Contract N00014-71-C-0220; NR Proj. 064-521)

(AD-A000345; TR-7111-1) Avail: NTIS CSCL 11/6

The properties of three alloys were studied: a Type HY-80 steel, a Type HY-130 steel, and a titanium alloy: Ti-6211. (6Al 1Nb 0.8Mo 1Ta). These materials were subjected to a wide range of uniaxial tensile rates of straining at room temperature: static tests, rapid loading tests, and dynamic tests. The results of these tests are replotted to demonstrate the dependence of stress as a function of rate of straining. It is concluded that these materials demonstrate a monotonic increase in stress as a function of strain rate. (Modified author abstract) GRA

N75-17498# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

WORLD STEEL STANDARD SPECIFICATIONS

30 Aug. 1974 764 p Transl. into ENGLISH from unidentified Chinese monograph

(AD-A000437; FTD-HC-23-856-74) Avail: NTIS CSCL 11/6

The report contains steel designations, chemical composition, properties, and uses in various countries and major enterprises throughout the world. GRA

N75-17499# Army Foreign Science and Technology Center, Charlottesville, Va.

THE PHENOMENON OF SUPERPLASTICITY OF TWO-PHASE ALLOYS

A. S. Tikhonov 17 Jan. 1974 22 p Transl. into ENGLISH from the monograph "Deformatsiya Metallov i Binarnykh Splavov" Moscow, 1971

(AD-A001199; FSTC-HT-23-1158-73) Avail: NTIS CSCL 11/6

Investigations of the phenomenon of superplasticity of two-phase alloys by several authors are discussed. A survey of experimental data on this subject is presented. Several hypotheses concerning superplasticity are analyzed. Prospects for the practical application of this phenomenon are discussed. The article includes several diagrams, formulas, and detailed table of parameters of two-phase alloys which manifest superplasticity. GRA

N75-17500# Army Foreign Science and Technology Center, Charlottesville, Va.

HIGH-SPEED DEFORMATION: BEHAVIOR OF METALLIC MATERIALS IN SHOCK LOADING

M. G. Lozinskii 19 Mar. 1974 60 p refs Transl. into ENGLISH from the monograph "Vysokoskorostnaya Deformatsiya, Voprosy Povedeniya Metalicheskikh Materialov pri Impulshom Nagruzhenii" Moscow, 1971 p 4-18, 56-59, 100-107, 118-121

(AD-A001475; FSTC-HT-23-1718-73) Avail: NTIS CSCL 11/6

Papers from the First Scientific-Technical Conference on the Theory and Practice of High-Speed Deformation are presented. Titles are the following: Theory and practice of shock deformation of metals and alloys; Present status and prospects for the use of energy induced in shock wave formation for strengthening metallic materials and fabricating multilayer composites; Experimental method in shockwave treatment of metals; Mechanism of plastic deformation in intense shockwaves; Microstructural features of plastic tensile deformation of laminated metal composites made with shock loading, over a wide temperature range; Pressing, welding, and melting of metal-based powder alloys in intense shockwave treatment. GRA

N75-17501# Rensselaer Polytechnic Inst., Troy, N.Y. Materials Div.

MICROSTRUCTURAL EFFECTS IN THE FATIGUE BEHAVIOR OF METALS AND ALLOYS

Norman S. Stoloff and David J. Duquette 30 Aug. 1974 204 p refs

(Contract N00014-67-A-0117-0010; N00014-67-A-0117-0012; NR Proj. 031-745; NR Proj. 036-093)

(AD-A001096) Avail: NTIS CSCL 11/6

This review examines the various stages of fatigue damage on the basis of changes in slip character and dislocation sub-structures resulting from solid solution alloying, thermomechanical treatments or precipitation hardening. Cyclic hardening and softening are related to fatigue life of a wide variety of alloy systems, including pure metals, commercial alloys, intermetallic compounds and directionally solidified eutectics. The influence on fatigue behavior of variations in structure produced by processing (e.g., casting defects, inclusions, surface notches) also are considered. Finally, the effects of temperature and aggressive environments on crack nucleation and propagation are related to metallurgical structure. GRA

N75-17502# Syracuse Univ., N.Y. Dept. of Chemical Engineering and Materials Science.

THICKNESS EFFECT ON CRACK TIP DEFORMATION AT FRACTURE Final Report

J. S. Ke and H. W. Liu Sep. 1974 24 p refs

(Contract DAAG46-73-C-0209; DA Proj. 1T0-61102-B-32A)

(AD-A000920; AMMRC-CTR-74-57) Avail: NTIS CSCL 11/6

The crack tip deformation at the onset of surface crack growth for four single edge cracked specimens having four different thicknesses were studied. The specimens were made of the ductile and tough HY-80 steel. The thickness contracting in the crack tip region and the tensile strain in the direction of load were measured. The crack tip necking-in acts like a notch. The depths, the root radii, and the angle changes of the necking-in notches were measured. The results indicated that the near tip strain can be used as a fraction criterion of ductile and tough materials. It was also found that the fracture strengths of the cracked specimens can be correlated with the tensile ductilities measured with Clausing specimens. Author (GRA)

N75-17503# General Electric Co., Schenectady, N.Y.

MACHINE CASTING OF FERROUS ALLOYS Annual Technical Report, 1 Feb. 1973 - 31 Jan. 1974

M. F. X. Gigliotti, Jr. May 1974 89 p refs

(Contract DAAG46-73-C-0111; ARPA Order 2267)

(AD-A001542; SRD-74-036; AMMRC-CTR-74-38) Avail: NTIS CSCL 13/8

A series of iron, nickel, and cobalt base alloys were permanent mold cast under varying conditions to evaluate techniques for improving the integrity of die casting. By appropriate control of heat flow it is possible to achieve permanent mold casting with mechanical properties equivalent to investment castings. Liquid-solid slurries were cast (Rheocasting) to evaluate casting properties and opportunities for enhanced mold life with a reduced temperature casting process. Casting properties are acceptable. It is not clear that there is enhanced mold life by this process. GRA

N75-17504# Boeing Aerospace Co., Seattle, Wash.

FRACTURE AND FATIGUE CRACK GROWTH BEHAVIOR OF SURFACE FLAWS AND FLAWS ORIGINATING AT FASTENER HOLES. VOLUME 1: RESULTS AND DISCUSSION Final Technical Report, 30 Jun. 1972 - 30 Sep. 1973

L. R. Hall, R. C. Shah, and W. L. Engstrom May 1974 366 p refs
(Contract F33615-72-C-1740)
(AD-A001597; AFFDL-TR-74-47-Vol-1) Avail: NTIS

The combined experimental and analytical study was undertaken to investigate the fatigue crack growth behavior of surface flaws and part-thru and thru cracks originating at fastener holes. Three alloys (2219-T851 aluminum, 9Ni-4Co-0.2C steel, and 6Al-4V (ELI) beta annealed titanium) were tested under three different loading profiles (constant cyclic load, periodic overload, spectrum load). Surface flaw test variables included loading conditions (uniform tension, pure bending, combined bending and tension), stress ratio (0.1, 0.3, 0.5), initial flaw shape (0.15 - a/2c 0.45), and initial flaw depth (0.2 - a/t - 0.8). Fastener hole flaw variables included hole condition (conventional reamed and cold worked), fastener type (close tolerance and Taper-lok), and initial crack shape (uniform thru the thickness and quarter circular part-thru). All tests were conducted in air having a relative humidity of about 10 percent. GRA

N75-17505# Army Foreign Science and Technology Center, Charlottesville, Va.
FRACUTRE MICROAPPEARANCE AND FRACTURE TOUGHNESS OF TEMPERED STEELS
O. N. Romaniv, Yu. V. Zima, and Yu. D. Petrina 14 Jun. 1974 12 p refs Transl. into ENGLISH from the book "Fiziko-Khimicheskaya Mekhanika, Materialov" USSR, Jan. 1973 p 3-8
(AD-A001492; FSTC-HT-23-0713-74) Avail: NTIS CSCL 11/6

This article discusses the results of comprehensive microanalysis of fractures which form during propagation of cracks in hardened steels with different contents of carbon at varying temperatures for tempering and testing. Brands 20Kh and 50KhN steels were used for tests. The temperature range was 100 to 650C. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N75-17506 British Library Lending Div., Boston Spa (England).
DETERMINATION OF DEFORMATION BY ESTABLISHING THE FIBEROUS MACROSTRUCTURE FROM A FAMILY OF FIBRES
G. D. Del and F. Kh. Tomilov 1974 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 6, 1974 p 91-94
(BLL-M-25018-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Methods developed to investigate plastic deformation in a family of metal fibers are reported. Data cover macrostructure, plane and axially symmetric deformation. A composite cylinder was used in the study. E.H.W.

N75-17507# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CERTAIN PRINCIPLES OF CATALYSIS ON ORGANIC SEMICONDUCTORS
M. M. Sakharov and O. A. Golovina 4 Oct. 1974 18 p refs Transl. into ENGLISH from the book "Problemy Kinetiki i Kataliza. 15: Mekhanizm i Kinetika Geterogennykh Reaktsii" Moscow, Izd. vo Nauka, 1973 p 94-101
(AD-A000673; FTD-MT-24-1755-74) Avail: NTIS CSCL 07/4

The report is a short survey of results obtained in Roginskiy's laboratory and published data on principles of catalysis on nonmetallic polymers having a conjugated system with semiconductor properties and the catalytic properties of organic semiconductors of a ciass of complexes with charge transfer. GRA

N75-17508 British Library Lending Div., Boston Spa (England).
RESEARCH ON ADHESION OF POLYOLEFINES
K. Nakao and S. Sawada Aug. 1974 13 p refs Transl. into ENGLISH from J. Adhes. Soc. Jap. (Japan), v. 6, no. 4, 1970 p 41-47 (305-311)
(BLL-RTS-9104) Avail: British Library Lending Div., Boston Spa, Engl.: £2.40; 4 BLL photocopy coupons

Microstructural evaluation of aluminum foil surfaces following melt adhesions of powdered polyethylene shows that the thickness of the layer becomes greater the higher the adhesion temperature. Conversely reduced peeling strength, when the adhesion temperature of polyethylene is too high, is attributed to polyethylene surface weak layer rupture. G.G.

N75-17509*# Scientific Translation Service, Santa Barbara, Calif.
MECHANISM OF THE INTERACTION BETWEEN TWO REDOX OXIDES IN GLASS
Durgadas Lahiri, Balai Mukherjee, and Rabindra Majumdar Washington NASA Feb. 1975 19 p refs Transl. into ENGLISH from Glastech. Ber. (Frankfort), v. 47, Pt. 1, Jan. 1974 p 4-9
(Contract NASw-2483)
(NASA-TT-F-16198) Avail: NTIS HC $3.25 CSCL 11B

Density and viscosity measurements on the glasses $Na_2O.x$ MeO.(g - x) SiO_2 were carried out at high and low temperatures. The molar volume and the viscosity data show the magnesium ions in the glass systems studied occur in tetrahedral and octahedral configurations at low and high temperatures respectively. Author

N75-17510*# Whittaker Corp., San Diego, Calif. Research and Development Div.
PREPARATION FOR FOAM COMPOSITES
Milan G. Maximovich 8 Nov. 1974 65 p
(Contract NAS2-8189)
(NASA-CR-137597) Avail: NTIS HC $4.25 CSCL 11D

Methods were developed for the fabrication of fire resistant panels utilizing polybenzimidazole (PBI) and Kerimid 601 resins along with glass, quartz, and Kevlar reinforcements. Stitched truss structure, both unfilled and filled with PBI foam, were successfully fabricated and tested. Second generation structures were then selected, fabricated, and tested, with a PBI/glass skin/PBI foam sandwich structure emerging as the optimum panel concept. Mechanical properties, smoke generation, and fire resistance were determined for the candidate panels. Author

N75-17511# Tokyo Univ. (Japan).
GLASS-FORMATION RANGES OF TERNARY SYSTEMS. PART 4: TELLURITES OF A-GROUP ELEMENTS Report of the Inst. of Industrial Science, Volume 24, No. 2
Minoru Imaoka and Toshiko Yamazaki Jan. 1975 55 p refs In JAPANESE and ENGLISH
Avail: NTIS HC $4.25

Results are presented of the experimental determination of the glass-formation range of all combinations of a-group elements. N.E.R.

N75-17512*# General Electric Co., Philadelphia, Pa. Space Sciences Lab.
DEVELOPMENT OF HIGH TEMPERATURE RESISTANT GRAPHITE FIBER COUPLING AGENTS
R. N. Griffin Feb. 1975 121 p refs
(Contract NAS3-17788)
(NASA-CR-134725; Rept-21863-6013-RU-00) Avail: NTIS HC $5.25 CSCL 11/4

Surface treatments were investigated as potential coupling agents to improve the elevated temperature shear strength retention of polyimide/graphite and polyphenylquinoxaline/graphite composites. The potential coupling agents were evaluated by fiber strand tensile tests, fiber and composite weight losses at 533 and 588K, and by interlaminar shear strength retention at 533 and 588K. The two surface treatments selected for more extensive evaluation were a coating of Ventromer T-1, a complex organometallic reaction product of titanium tetrachloride and trimethyl borate, and a polyphenylquinoxaline (PPQ) sizing which was pyrolyzed in nitrogen to form a carbonaceous layer on the fiber. Pyrolyzed polyphenylquinoxaline is a satisfactory coupling agent for polyimide/Thornel 300 graphite fiber composites. During 1000 hours aging at 588K such composites lose a little over half their transverse tensile strength, and suffer a slight loss in flexural modulus. No degradation of flexural strength or in-

terlaminar shear strength occured during 1000 hours aging at 588K. None of the coupling agents examined had a markedly beneficial effect with polyphenylquinoxaline composites. Author

N75-17513# National Aeronautical Establishment, Ottawa (Ontario).
STOICHIOMETRY OF CYCLOALIPHATIC EPIDE RESINS REACTED WITH PRIMARY AMINES
P. D. McLean and R. F. Scott Nov. 1974 33 p refs
(NRC-14450; MS-135) Avail: NTIS HC $3.75

Stoichiometry was studied along with its effect on tensile properties of several five and six membered ring cycloaliphatic epide resins reacted with the primary amine methylene dianiline. The results showed that up to 100% excess of the amine could be used successfully. Possible reasons for this phenomenon are discussed. It was found that the plastics exhibited high strength, high elongation and were predominantly ductile at failure.
Author

N75-17514# Oak Ridge Y-12 Plant, Tenn.
THERMAL CONDUCTIVITY OF CARBON FOAM
J. D. Lore, H. L. Richards, and M. E. Ward Sep. 1974 31 p refs
(Contract W-7405-eng-26)
(Y-1955) Avail: NTIS HC $3.75

Carbon foam materials, carbonized to 1273 K and graphitized to 3273 K prior to testing, were evaluated for thermal conductivity by three steady-state techniques: guarded hot plate, comparative apparatus, and radial flow. Tests were conducted over the temperature interval from 300 to 2800 K. Analyses were made of the material fabrication parameters, pertinent physical properties, and employed test techniques. Interpretation of data and a comparison with the findings of other laboratories were accomplished. Author (NSA)

N75-17515# Bendix Corp., Kansas City, Mo.
PROCESS EVALUATION OF NEW CELLULAR SILICONE MATERIAL
G. W. Edman, IV Sep. 1974 25 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-1082-Rev) Avail: NTIS HC $3.25

The processing characteristics of some new cellular silicone formulations were studied and evaluated. To determine the relative processability of the experimental materials, sample parts were molded at various molding pressures. The wall thickness variation of the resultant finished parts was compared to that obtained for standard material counterparts processed under the same conditions. Additional tests of physical and chemical properties were performed to determine if there was an equivalency between the two materials as forecasted. Results of the wall thickness evaluation and observations made during sample fabrication indicate that the experimental materials do indeed process more readily than standard formulations, but the projected equivalency of finished part properties was not met. Author (NSA)

N75-17516# Bendix Corp., Kansas City, Mo.
TEMPERATURE DEPENDENT PROPERTIES OF POTTING MATERIALS
J. M. Walker Sep. 1974 30 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-1133-Rev) Avail: NTIS HC $3.75

The mechanical, electrical, and thermal properties of a general purpose epoxy potting compound, filled with either glass microspheres or aluminum oxide and catalyzed with either diethanol-amine or Epon Z are discussed. Twelve formulation-cure cycle combinations were chosen for evaluation. The temperature properties from-65 to 400 F of four of the combinations are given. Modulus versus temperature polynomials were calculated for the diethanolamine catalyzed material. Author (NSA)

N75-17517# Bendix Corp., Kansas City, Mo.
STATIC COMPRESSIVE TESTING OF RIGID POLYURETHANE FOAM
T. E. Neet and S. L. DeGisi Oct. 1974 49 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-1036-Rev) Avail: NTIS HC $3.75

The relationships between the compressive strength and modulus and the test temperature and density of 11 foam systems are presented. The results of the study are graphically illustrated. Author (NSA)

N75-17518# Bendix Corp., Kansas City, Mo.
USE OF EN-7 TO ENCAPSULATE ANALYZER ASSEMBLIES Final Report
R. D. Elmore Sep. 1974 14 p Revised
(Contract AT(29-1)-613)
(BDX-613-1135-Rev) Avail: NTIS HC $3.25

The feasibility of using EN-7 as a substitute for Adiprene L100 curing agent for analyzer encapsulation was investigated. Since many analyzer assemblies cannot tolerate the usual EN-7 cure temperatures, this investigation was limited to a maximum cure temperature of 71 C. The results of these tests indicate that a 20 hour cure at 49 C is adequate to provide sufficient hardness if followed by additional room temperature cure.
Author (NSA)

N75-17519# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Ground Equipment/Materials Directorate.
THERMALLY STABLE ORGANOMETALLIC POLYMERS
Shelba P. Brown Jul. 1974 23 p refs
(DA Proj. 1T1-62105-AH-84)
(AD-A000753; RL-75-2) Avail: NTIS CSCL 07/3

The objective of the work covered in this report is to prepare hybrid polymers having good thermal, oxidative, and hydrolytic stability, plus good mechanical properties in the vicinity of 900 to 1000F. Hybrid polymers in this case refers to polymers prepared from organometallic compounds, which are combinations of organic and metal radicals. During the course of this work, 14 new difunctional monomers and polymers were prepared. All of these compounds are amenable to polymerization but due to the time-consuming nature of the synthetic work and the difficulties encountered with characterization of the polymerized products, only a few of these compounds were subjected to cure studies. The monomers contain various combinations of carboranes, ferrocenes, and siloxane groups. GRA

N75-17520# Florida Univ., Gainesville. Dept. of Materials Science and Engineering.
CORROSION AND STRUCTURAL CHANGES IN GLASS Final Report
L. L. Hench, R. W. Gould, R. E. Reed-Hill, W. B. Person, and D. M. Sanders Oct. 1974 15 p
(Contract N00014-68-A-1073-0006)
(AD-A000432) Avail: NTIS CSCL 11/2

New methods for obtaining a quantitative description of surface and bulk structural changes in glass are described. The new techniques include X-ray diffraction analysis of amorphous solids using pair function and disorder distribution functions. Application of the X-ray method to glass corrosion, thermal treatments, glass fabrication variables, and fast neutron damage is reviewed. Infrared reflection spectroscopy (IRRS) was developed in the contract as a rapid, nondestructive tool for characterizing the surface of bulk glass samples. Scanning electron microscopy with X-ray dispersive analysis and electron microprobe analysis were used to confirm interpretations. Auger electron spectroscopy with ion beam milling was also applied to glass surface corrosion analysis of ternary glass systems. Several areas of proposed research using these new methods are presented. Abstracts of 20 papers prepared during the contract are included. (Modified author abstract) GRA

N75-17521# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF NEOPRENE COATINGS ON THE CYCLIC FATIGUE OF SPECIMENS AND PARTS SUBJECTED TO THE ACTION OF FRETTING-CORROSION
V. S. Ivanova and M. G. Veitsman 7 Oct. 1974 12 p refs Transl. into ENGLISH from the book "Ustalost Metallov i Splavov" USSR, 1971 p 103-108
(AD-A000442; FTD-HC-23-2124-74) Avail: NTIS CSCL 11/3

Comparative fretting-corrosion tests were performed to develop effective protection for coupled surfaces. The results indicate that the neoprene coating increases the fatigue strength by preventing physico-chemical processes. F.O.S.

N75-17522# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
RATING METHOD AND LUBRICANT APPETITE STUDY FOR AN AIR-COOLED ROTARY ENGINE Interim Report, Aug. 1973 - Mar. 1974
J. A. Russell and S. J. Lestz May 1974 27 p refs
(Contract DAAD05-72-C-0053)
(AD-A001648; AFLRL-41) Avail: NTIS CSCL 11/8

Experimental results with a 25-hp charge-cooled rotary combustion engine are presented for a variety of lubricant stocks and additive packages. A rating method which combines endurance and deposition level is described. Lubricant performance is evaluated based upon this rating scheme, and contribution of base stock and additive package components is analyzed. GRA

N75-17523# General Electric Co., Schenectady, N.Y.
CERAMIC SINTERING Semiannual Technical Report, 1 Apr. - 31 Oct. 1974
Joseph H. Rosolowski and Charles D. Greskovich Oct. 1974 66 p refs
(Contract N00014-74-C-0331; ARPA Order 2698)
(AD-A001012; SRD-74-116) Avail: NTIS CSCL 11/2

Measurement of the rate of oxidation and creep rate in air of chemically vapor deposited Si3N4 at around 1500C are reported. Attempts to prepare pure, dense Si3N4 bodies by hot pressing powder at ultra-high pressures were unsuccessful. Resistance heaters made of dense, sintered SiC were tested and found to have in-use lifetimes very much longer than those of commercially available heaters tested in the same way. Microscopic examination of the structures developed during the initial stage sintering of SiC doped with C and B indicates that these dopants inhibit surface diffusion until densification begins at around 1500C. Bodies of B4C having about 94% of theoretical density were made by using conventional sintering processes and doping the powder with either SiC or Be4C. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N75-17524# Mound Lab., Miamisburg, Ohio.
IMPROVED PETN PARTICLE SIZE ANALYSES
N. R. Bonekowski 15 Aug. 1974 15 p ref
(Contract AT-33-1-GEN-53)
(MLM-2098) Avail: NTIS HC $3.25

A significant improvement in obtaining more precise and accurate particle size distribution data for explosive power evaluation studies has been realized. The improved capability of the Model T Coulter Counter over its predecessor, the Model A is evaluated. A Digital Equipment Corporation PDP-12A laboratory computer was used to statistically evaluate data collected using both models on National Bureau of Standards glass beads and three samples of pentaerythritol tetranitrate (PETN) high explosive with various surface areas; scanning electron photomicrographs of the samples are included. Also, computer printouts of particle size data and graphic comparisons of the performance of both Coulter Counter models are included. The Model T proved to be faster than the Model A, easier to calibrate, able to cover a greater range of particle sizes, and capable of analyzing a wide variety of sample geometries. Author (NSA)

N75-17525# Societe Europeenne de Propulsion, Bordeaux (France).
LOW FREEZING POINT HYDRAZINE MONOPROPELLANT MIXTURE Final Report [ETUDE-MISE AU POINT-ESSAIS DES MELANGES D'HYDRAZINE MONERGOL A BASSE TEMPERATURE DE CONGELATION RAPPORT DE SYNTHESE]
M. Lecoq 10 Jan. 1974 37 p refs In FRENCH Revised
(Contract ESTEC-1388/71-HP)
(TS/SM-42048/74-Rev-1; ESRO-CR(P)-474-Rev-1) Avail: NTIS HC $3.75

Low freezing point hydrazine mixtures for spacecraft auxiliary propulsion were studied. Hydrasinium nitride in binary and ternary mixtures with hydrazine allows comparable or better performances than hydrazine alone. ESRO

N75-17526# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
POLYMERIC NICTRIC ACID ESTERS AND PROPELLANT BONDS CONTAINING NITRATE GROUPS [POLYMERE SALPETERSAEUREESTER UND NITRATGRUPPENHALTIGE FESTTREIBSTOFFBINDER]
F.-W. Wasmann 31 Dec. 1973 42 p refs In GERMAN
(ICT-5/73) Avail: NTIS HC $3.75

Several polyether nitric acid esters were prepared. Poly 3,3 bis (nitratomethyl) propylene oxide was synthesized through cationic polymerization of 3,3 bis (nitratomethyl) oxa cyclobutane. The corresponding polyethylene and polyethylene oxide were also prepared. Molecular weight, explosion and burning temperature, stability, softening interval, abrasion and shock sensitivity, and other outstanding characteristics were measured. ESRO

N75-17527# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
MECHANICAL AND ENVIRONMENTAL BEHAVIOR TESTS OF AMMUNITION WITHOUT CARTRIDGE CASES [PRUEFUNG VON HUELSENLOSER MUNITION AUF IHR MECHANISCHES UND UMWELTBEDINGTES VERHALTEN]
D. Schmitt 31 Dec. 1973 49 p refs In GERMAN
(ICT-9/73) Avail: NTIS HC $3.75

Specifications for testing environmental and mechanical stresses on caseless ammunition and combustible cartridges are given. Dynamic vibration, shock, and temperature tests were carried out, and forming procedure, transport and climatic hazards were simulated. ESRO

N75-17528# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
INFLUENCE OF THE GRANULAR SIZE ON THE VISCOSITY OF UNHARDENED COMPOSITE PROPELLANTS CONTAINING AP [EINFLUSS DER KORNGROESSE AUF DIE VISKOSITAET NICHTAUSGEHAERTETER AP-HALTIGER COMPOSITE-FTS]
H. Pfoertner 31 Dec. 1973 35 p refs In GERMAN
(ICT-12/73) Avail: NTIS HC $3.75

A tube viscometer was developed for investigating the relation between viscosity and grain size of an almost monodisperse unhardened plastic propellant. The grain size was between 9 and 215 and the viscosity of 65% ammonium perchlorate and 35% polyurethane binder mixtures was measured. The results were interpreted using known models, among which von Mooney's theoretically derived equation seemed adequate to describe the system. ESRO

N75-17529# Picatinny Arsenal, Dover, N.J.
EVALUATION OF PROPELLANT QUICK TEST TO ASCERTAIN SERVICEABILITY OF ARTILLERY PROPELLANT STOCK
Norris S. Garman, Francis X. Murphy, James M. Murphy, and James Angelotti Sep. 1974 25 p refs
(AD-A000646; PA-TR-4647) Avail: NTIS CSCL 19/1

The report concerns the versatility of the Propellant Quick Test in its application to standard artillery formulations in order to establish safe life cutoff criteria for single, double, and triple-base propellants. The Quick Test is adaptable to the existing surveillance routine; but it has not been conclusively determined whether its versatility of application suffices to establish reliable hazard cutoff points and, altogether, whether it is founded upon an analytically sound basis. Consequently, the purpose of this program was to investigate and evaluate this test. The procedures used were: Colorimetric microdetermination of nitrogen dioxide in storage atmospheres of bulk propellant; preparing and quick testing synthetic atmospheres; and semiquantitative detection of nitrogen dioxide in storage atmospheres of bulk propellant. GRA

N75-17530# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FORMATION OF THE CONDENSED PHASE IN A METAL-

LIZED SOLID PROPELLANT ROCKET ENGINE
Paul Kuentzmann 10 Oct. 1974 55 p refs Transl. into ENGLISH from Rech. Aerospatiale (Chatillon-SousBagneux), no. 210, 1973 p 1-38
(AD-A000630; FTD-HC-23-2718-74) Avail: NTIS CSCL 21/9

A brief theoretical outline is given of phenomena leading to formation and growth of alumina particles. An attempt is made to predict the evolution of the condensed phase through its history, i.e. successively in the combustion zone, in the combustor and in the nozzle. In the combusion zone, which appears to be rather thin, particles are formed very early, either in the vapor phase or on the surface of aluminum particles. In the combustor, condensed and gaseous phases are approximately in equilibrium, and particle growth is due to turbulent diffusion and acoustic effects. A schematic analysis of the distribution of the condensed phase in the nozzle inlet section is presented. GRA

N75-17531# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
JET FUEL THERMAL STABILITY IMPROVEMENTS THROUGH FUEL PROCESSING Final Report, Jan. 1970 - 31 Dec. 1973
Herbert R. Lander, Jr. and Charles R. Martel Aug. 1974 37 p refs
(AF Proj. 3048)
(AD-A001623; AFAPL-TR-74-35) Avail: NTIS CSCL 21/4

The effectiveness of various refining processes in upgrading the thermal stability of aircraft turbine engine fuels has been examined. A Jet A-1 fuel was subjected to clay-treatment, desulfurization, and hydrogenation. The thermal stability of the treated and untreated fuels was determined using the Jet Fuel Thermal Oxydation Tester (JFTOT) thermal stability method. Desulfurization increased the JFTOT breakpoint by 120 to 140F, and desulfurization followed by hydrogenation increased the JFTOT breakpoint of the fuel by more than 150F. A low-aromatic JP-4 type of fuel, blended from a hydrogenated stock and a solvent-treated stock to remove aromatics, was also tested and compared to a conventional JP-4 fuel. Desulfurization, hydrogenation, clay treatment, and aromatic solvent extraction have been shown to be effective methods for upgrading the thermal stability of jet fuels. GRA

N75-17532# Ballistic Research Labs., Aberdeen Proving Ground, Md.
COMPUTATIONAL ANALYSIS OF THE SQOC TWO DIMENSIONAL HYDRODYNAMIC COMPUTER CODE Final Report
Toni M. Taylor Sep. 1974 20 p refs
(DA Proj. 1T1-61102-A-33E)
(AD-A001552; BRL-MR-2408) Avail: NTIS CSCL 19/4

The SQOC Code, a two-dimensional hydrocynamic FORTRAN Code designed to compute the hydrodynamics of an unsteady detonation wave, has been evaluated for use on the BRLESC2 computer at the Ballistic Research Laboratories (BRL) as a tool in the study of the detonation of real explosive materials. An analysis of the results indicated that the mesh spacing must be less than 0.05 cm in order to obtain accurate results. With this mesh size, a charge 1.0 cm in radius and 2.0 cm long requires 48000 words of high speed memory (48K) and 40 minutes or more of machine time. Problems using more than 48K memory were not run because of a long time delay between calculations. A failure diameter for a particular type of cast TNT was obtained through experiment and computation with inconsistent results. As a result, the code in its present form is not recommended for use at the BRL. GRA

N75-17533# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
DEVELOPMENT OF A BENCH PROCEDURE FOR EVALUATING THE EFFECTIVENESS OF DISPERSANT: DETERGENT GASOLINE ADDITIVES, PHASE 1 Interim Report
A. A. Johnson and H. W. Marbach, Jr. Jun. 1974 32 p refs (Contract DAAK02-73-C-0221)
(AD-A000921; AFLRL-43) Avail: NTIS CSCL 14/2

A laboratory bench procedure for the evaluation of dispersant-detergent gasoline additive effectiveness in controlling and/or inhibiting engine intake systems deposition is presented. A full-size evaluation procedure was selected for use as a baseline tool and a generator of deposits and deposit-causing precursors. This procedure accelerates carburetor throat and intake system deposits by recycling the crankcase off-gases back into the intake system via the main carburetor air stream. Results show that inorganic acids in the off-gas react with fuel to form carburetor throat deposits, and inorganic acid precursors can be easily generated in the laboratory, eliminating the need for the engine-combustion process. GRA

N75-17534# Naval Weapons Center, China Lake, Calif.
A NEW CLASS OF HIGH DENSITY FUELS. 7-N,N-DIALKYLAMINO-1,3,5-TRIAZAADAMANTANES (DIADAM FUELS)
Arnold T. Nielsen Oct. 1974 27 p refs
(ZR00001; ZR01301)
(AD-A000100; NWC-TP-5676) Avail: NTIS CSCL 07/3

A new class of high-density fuels has been synthesized - the 7-(N,N-dialkylamino)-1,3,5-triazaadamantanes (DIADAM fuels). They are readily prepared in high overall yield from inexpensive reactants including principally ammonia, formaldehyde, nitromethane, alkanals and hydrogen (55-60% by weight from ammonia and formaldehyde). Bipropellant systems using these fuels are hypergolic. The new fuels have several other desirable properties including high density, high hydrogen density, high specific impulse, and high volumetric heat of combustion. They are thermally stable and non-corrosive. Their high solubility in most solvents including benzene and water imparts added safety in the event of spillage. Compared to certain other high-density fuels they have relatively low viscosities and low pour points. A brief discussion of new ideas in fuel design, and a correlation between structure of the DIADAM fuels with selected physical properties (density, melting point, heat of combustion) are presented. Author (GRA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N75-17535 British Library Lending Div., Boston Spa (England).
SUMMARIES OF THIRTEEN OF THE PAPERS PRESENTED AT THE CONFERENCE ON SAFE TECHNOLOGY: GENERATION AND ACTION OF EXPLOSIVE SYSTEMS
4 Feb. 1974 15 p Transl. into ENGLISH from German articles Conf. held at Karlsruhe, West Ger., 27-29 Jun. 1973
(BLL-SMRE-Trans-6317-(8313.4)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Summaries of research done on explosive systems are given. Data cover various types of explosions including gas, gas-air mixtures, and dust-gas. Data are also given on structure of detonation and propagation fronts and expansion and condensation processes. E.H.W.

N75-17536 British Library Lending Div., Boston Spa (England).
EXPERIENCE IN USING POWDER-TYPE ION EXCHANGERS
R. A. Vincent 4 Mar. 1974 16 p Transl. into ENGLISH from VGB Feedwater Conf. (Essen), 1970 p 35-40
(BLL-CE-Trans-5784-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Properties of powdered resins are discussed with regard to filtration and deionization. The economic and technical consequences are described, which result from the fact that the powdered resins are discarded after use. Technical details are given on the design and operation of condensate purification plant using powdered resins. Author

N75-17537 British Library Lending Div., Boston Spa (England).
BICARBONATE REMOVAL BY RAPID DECARBONISATION WITH LIME AND BY ION EXCHANGE: A COMPARISON OF METHODS
W. Klump 28 Feb. 1974 12 p Transl. into ENGLISH from VGB Feedwater Conf. (Essen), Oct. 1970 p 17-21
(BLL-CE-Trans-5766-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The removal of bicarbonate from the circulating water in

cooling systems is discussed in terms of ion exchange, and decarbonization by lime. Costs are also discussed. F.O.S.

N75-17538 British Library Lending Div., Boston Spa (England).
DEVELOPMENTS IN COUNTER-CURRENT REGENERATION
P. Kanow and P. Treille 27 Feb. 1974 14 p refs Transl. into ENGLISH from VGB Feedwater Conf. (Essen), Oct. 1970 p 41-44
(BLL-CE-Trans-5758-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Methods for the demineralization of water in systems which have a continuous and substantial water demand and those which have a discontinuous and relatively low water demands are discussed. The counter-current process and its application to stratified beds were investigated: single or stratified bed units with hydrochloric acid regeneration, and single or stratified bed units with sulfuric acid regeneration. M.J.S.

N75-17539# Brookhaven National Lab., Upton, N.Y.
PECULIARITIES OF CORONA DISCHARGE IN LIQUID HELIUM
V. A. Goncharov and V. I. Levitov 1974 12 p refs Transl. into ENGLISH from Izv. Akad Nauk SSSR, Energ. Transp. (USSR), v. 10, no. 2, 1974 p 145-148 Sponsored by AEC
(BNL-TR-578) Avail: NTIS HC $3.25

The corona discharge in liquid helium occurring at point electrodes with radius of 0.01 to 1.0 mm and electrode separation of 6 to 45 mm was experimentally studied. The V-I characteristics of the corona discharge are presented. The critical and inception corona voltages and the extinction voltages were measured. The characteristic voltages (onset, critical, and extinction) were compared for a positive and a negative corona. The mobilities of the electric charge carriers in liquid helium were determined from the corona V-I characteristics.
Author (NSA)

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N75-17540 British Broadcasting Corp., Kingswood (England). Research Dept.
THE POSSIBILITY OF SENDING PROGRAMME SPEECH CONTRIBUTIONS DIGITALLY OVER THE PUBLIC TELEPHONE NETWORK
M. G. Croll Jan. 1975 14 p refs
(BBC-RD-1975/6) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Methods of sending digital information over the public telephone network and reviews techniques for digitally coding speech at low bit rates are discussed. It is concluded that a good quality speech channel cannot be derived digitally for the present system, using currently available devices, but new advances and development of the Post Office digital network offer some possibilities for the future. Author

N75-17541 British Broadcasting Corp., Kingswood (England). Research Dept.
TRANSMITTING ARRAYS FOR LOW-POWER RELAY STATIONS: ARRAYS OF uhf LOGPERIODIC AERIALS
J. L. Riley Jan. 1975 12 p refs
(BBC-RD-1975/7) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Log-periodic aerials are considered for use as transmitting arrays at low-power u.h.f. relay stations. The movement of the aerials' phase-centre with frequency requires careful positioning of aerials in an array to preserve radiation pattern bandwidth. The aerials are mounted on arms up to 0.7 m long fixed to a cantilever pole by friction clamps. Measured horizontal and vertical radiation patterns of typical aerial installations are presented and from these their gain is computed. The reflection coefficient of an aerial array should present no problems with modern transposers. The radiation pattern performance can be predicted satisfactorily for planning purposes. Author

N75-17542 British Broadcasting Corp., Kingswood (England). Engineering Div.
DIGITAL VIDEO: SUB-NYQUIST SAMPLING OF PAL COLOUR SIGNALS
V. G. Devereux Jan. 1975 18 p refs
(BBC-RD-1975/4) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A simple method of applying sub-Nyquist sampling techniques to digital coding of PAL color video signals is described. This technique employs a sampling frequency of twice the color subcarrier frequency, the sampling instants being maintained at a specified phase relative to the reference subcarrier. For System I (625-line, PAL) video signals the resulting sampling frequency is about 8.87 MHz. Comb filtering in the upper part of the video band is used both to recover a standard PAL video signal and to remove unwanted alias components from the sampled signal. The results of subjective tests indicated that for a single coding and decoding operation, broadcast-quality colour pictures can be obtained from an 8-bit per sample p.c.m. system employing this sub-Nyquist sampling frequency; with a 6-bit d.p.c.m. system the impairment was graded 'just perceptible' on critical pictures. Further tests are required to examine the suitability of this sub-Nyquist technique for general use in a broadcasting network which might include several codes (coding and decoding operations) in tandem. Author

N75-17543*# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
A STUDY OF SYNCHRONIZATION TECHNIQUES FOR OPTICAL COMMUNICATION SYSTEMS Final Report
R. M. Gagliardi Jan. 1975 14 p refs
(Grant NGL-05-018-104)
(NASA-CR-136761; USCEE-480) Avail: NTIS HC $3.25 CSCL 17B

The study of synchronization techniques and related topics in the design of high data rate, deep space, optical communication systems was reported. Data cover: (1) effects of timing errors in narrow pulsed digital optical systems, (2) accuracy of microwave timing systems operating in low powered optical systems, (3) development of improved tracking systems for the optical channel and determination of their tracking performance, (4) development of usable photodetector mathematical models for application to analysis and performance design in communication receivers, and (5) study application of multi-level block encoding to optical transmission of digital data. E.H.W.

N75-17544# National Aviation Facilities Experimental Center, Atlantic City, N.J.
INVESTIGATION OF SHIELDING METHODS AND MATERIALS FOR REDUCTION OF RADIOFREQUENCY INTERFERENCE TO BACKUP EMERGENCY COMMUNICATION Interim Report, May - Oct. 1973
George C. Apostolakis and Arthur R. Moss Apr. 1974 38 p
(AD-779293; FAA-NA-74-3) Avail: NTIS HC $3.25

Backup emergency communication (BUEC) equipment operation in the field has been reported to be impaired by radiofrequency interference (RFI). This RFI enters the BUEC transceiver via its antenna as well as directly through imperfections in the internal shielding of the transceiver itself. Methods of reducing the effect of this RFI by shielding of the antenna and the transceiver itself were studied. It was found that the radome catwalk deck itself was an effective shield against both ultrahigh frequency (UHF) and very high frequency (VHF) RFI, and that moving the antenna radially inward from the protective rail of the catwalk provided effective shielding. Additionally, it was found that UHF RFI generated by the common digitizer (CD) was completely eliminated by a 6X6-foot copper mesh screen interposed between the BUEC antenna and the CD, however, this means did not provide complete shielding for VHF interference. Finally, direct RFI leakage into the transceiver appears to be through the front end of the transceiver. Author

N75-17545*# Magnavox Research Labs., Torrance, Calif. Advanced Products Div.

TDRSS TELECOMMUNICATIONS STUDY, PHASE 2 Final Report, Aug. - Dec. 1974
C. R. Cahn 1 Dec. 1974 59 p refs
(Contract NAS5-20047)
(NASA-CR-143689; R-4996) Avail: NTIS HC $4.25 CSCL 17B

Providing an extension to parametric analysis of the telecommunications support capability of the Tracking and Data Relay Satellite System (TDRSS), this phase considers candidate modulation waveforms which could meet the shuttle telecommunications requirements and also be compatible with the TDRSS single access S-band service. In addition, it considers the feasibility of modifying a single access S-band user transponder for operation with conventional STDN signals emanating from remotely located ground stations. Author

N75-17546*# United Aircraft Corp., Norwalk, Conn. Norden Div.
LASER SPACE RENDEZVOUS AND DOCKING TRADEOFF Quarterly Progress Report, 8 Mar. - Dec. 31 1974
S. Adelman, S. Levinson, P. Raber, and F. Weindling 31 Dec. 1974 134 p refs
(Contract NAS8-30728)
(NASA-CR-120615; Rept-1247-R-0004) Avail: NTIS HC $5.75 CSCL 17I

A spaceborne laser radar (LADAR) was configured to meet the requirements for rendezvous and docking with a cooperative object in synchronous orbit. The LADAR, configurated using existing pulsed CO2 laser technology and a 1980 system technology baseline, is well suited for the envisioned space tug missions. The performance of a family of candidate LADARS was analyzed. Tradeoff studies as a function of size, weight, and power consumption were carried out for maximum ranges of 50, 100, 200, and 300 nautical miles. The investigation supports the original contention that a rendezvous and docking LADAR can be constructed to offer a cost effective and reliable solution to the envisioned space missions. In fact, the CO2 ladar system offers distinct advantages over other candidate systems. Author

N75-17547# Lockheed Missiles and Space Co., Palo Alto, Calif.
MESSAGE TRANSMISSION, CHAPTER 1
K. Sh. Zigangirov [1975] 6 p Transl. into ENGLISH from the book "Protsedury Posledovatelnogo Dekodirovaniia" Moscow, SVIAZ, 1974 p 4-9, 13-15
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The mathematical theory of message transmission in discrete channels was discussed. Data are also given on channel coder and decoder structure, sequential decoding, and convolution decoding. E.H.W.

N75-17548*# RAND Corp., Santa Monica, Calif.
ORBIT-SPECTRUM SHARING BETWEEN THE FIXED-SATELLITE AND BROADCASTING-SATELLITE SERVICES WITH APPLICATIONS TO 12 GHz DOMESTIC SYSTEMS Final Report
Edward E. Reinhart May 1974 250 p refs
(Contract NAS5-21722)
(NASA-CR-143688; R-1463-NASA) Avail: NTIS HC $7.50 CSCL 17B

A systematic, tutorial analysis of the general problem of orbit-spectrum sharing among inhomogeneous satellite system is presented. Emphasis is placed on extrapolating and applying the available data on rain attenuation and on reconciling differences in the results of various measurements of the subjective effects of interference on television picture quality. An analytic method is presented for determining the approximate values of the intersatellite spacings required to keep mutual interference levels within prescribed limits when many dissimilar satellites share the orbit. A computer model was developed for assessing the interference compatibility of arbitrary configurations of large numbers of geostationary satellite systems. It is concluded that the band from 11.7 c GHz can be shared effectively by broadcasting-satellite and fixed-satellite systems. Recommendations for future study are included. Author

N75-17549# Sandia Labs., Albuquerque, N.Mex.
ALARM COMMUNICATIONS AND DISPLAY SEGMENT (ACADS) Technical Order Publications Plan CDRL Item 20
Aug. 1974 8 p refs
(Contract AT(29-2)-789)
(SAND-74-0149) Avail: NTIS HC $3.25

A combined manual consisting of a combined operations and maintenance instructions manual and an illustrated parts breakdown manual is discussed. The types of equipment it will be provided for are listed along with the delivery dates for the manual. The level of writing in the manuals and their contents (inspection, lubrication, and maintenance requirements) are also discussed. M.J.S.

N75-17550# Bendix Corp., Kansas City, Mo.
AUTOMATIC RADAR-SENSITIVITY MEASUREMENT Final Report
K. E. Hardinger Sep. 1974 31 p Revised
(Contract AT(29-1)-613)
(BDX-613-1134-Rev) Avail: NTIS HC $3.75

Work is described that results in development of the necessary techniques to automatically measure radar receiver and system sensitivity. Both measurement speed and repeatability are improved over that possible by manual methods. Combined logic and analog techniques were used to derive a system suitable for both in-process and final-assembly tests on radar systems and RF subassemblies. Author (NSA)

N75-17551# Royal Radar Establishment, Malvern (England).
A CROSS-AMBIGUITY PROGRAMME TO EXPLORE THE SENSITIVITIES OF WAVEFORM/FILTER COMBINATIONS
J. B. G. Roberts and F. J. Braithwaite Jan. 1974 13 p ref
(RRE-TN-780; BR42223) Avail: NTIS HC $3.25

In an investigation of the use of an inverse filter (as opposed to a matched filter) for the optimum reception of waveforms in certain problems, it became necessary to be able to predict the response of the filter to Doppler-shifted signals. To this end a group of ALGOL 68 computer procedures were written to allow evaluation and graphical display of the cross-ambiguity function for general waveforms and filters (real or complex).
Author (ESRO)

N75-17552# Georgia Inst. of Tech., Atlanta. Atlanta Engineering Experiment Station.
BROADBAND ANTENNA MEASUREMENT TECHNIQUES Final Technical Report, 16 Feb. 1973 - 19 Mar. 1974
Joseph D. Adams, Fred L. Cain, and Charles E. Ryan, Jr. Sep. 1974 159 p refs
(Contract F30602-73-C-0194)
(AD-787867; GIT-A-1517-FTR; RADC-TR-74-222) Avail: NTIS CSCL 09/5

The report presents the results of a program to study and investigate advanced measurement techniques for evaluating the performance of broadband antenna systems for use in high resolution radar systems. New techniques to measure, record, and analyze antenna gain and pattern performance were studied, and the feasibility of developing the necessary instrumentation to perform these measurements was investigated. Systems based on the use of broadband noise signal sources and systems using sweep frequency techniques were studied. (Modified author abstract) GRA

N75-17553# Army Foreign Science and Technology Center, Charlottesville, Va.
EXPERIMENTAL INVESTIGATION OF THE CHARACTERISTICS OF REFLECTION FROM UNEVEN GROUND SURFACES
A. B. Babaev, V. P. Logachev, V. A. Fedorov, and V. N. Parfentev 14 Jun. 1974 6 p refs Transl. into ENGLISH from Tr. Energ. Inst. (Moscow), v. 110, 1972 p 87-89
(AD-A000236; FSTC-HT-23-0224-74) Avail: NTIS CSCL 20/4

Investigations were carried out into characteristics of reflection from uneven ground surfaces. Flights were made over forests and other uneven surfaces and reflection characteristics were measured with a receiver with a linear amplitude characteristic. The results of measurements and observations are shown in table form. GRA

N75-17554# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AN IONOSPHERIC TOTAL ELECTRON CONTENT DISTURBANCE ASSOCIATED WITH THE LAUNCH OF NASA'S SKYLAB Environmental Research Papers
Michael Mendillo, Gerald S. Hawkins, and John A. Klobuchar 29 Jul. 1974 40 p refs
(AF Proj. 4643)
(AD-A000018; AFCRL-TR-74-0342) Avail: NTIS CSCL 04/1

By monitoring the amount of Faraday rotation a plane polarized satellite signal experiences in traversing the ionosphere, it is possible to measure the total number of electrons in a column of unit cross section through the earth's ionosphere. Report discusses: Ground-based total electron count observations and the Skylab launch; electron loss mechanisms in the F-region; diffusion of the Saturn V S-II plume in the ionosphere; ionosonde observations; and estimates of photochemical and aeronomic processes capable of depleting the expanding plume. GRA

N75-17555# Danish Meteorological Inst., Copenhagen. Geophysical Dept.
IONOSPHERIC RESEARCH USING SATELLITES Interim Scientific Report, 1 Nov. 1971 - 31 Oct. 1973
Ib Steen Mikkelsen 31 Dec. 1973 24 p refs
(Grant AF-AFOSR-2161-72; AF Proj. 4643)
(AD-A000021; AFCRL-TR-74-0416; ISR-2) Avail: NTIS CSCL 04/1

Monitoring the total electron content of the ionosphere by recording the Faraday rotation of radio signals from geostationary satellite is a powerful tool to study the temporal variations of the ionosphere. Using an auroral zone station like Norssarssuaq, it is possible to study the very irregular region which is seen during night time north of the trough of the ionosphere. A connection of night time increases of the electron content and substorm activity is discussed. The data reduction of the Faraday rotation is described in detail. A method is given for solving the n-pi ambiguity and for determining the temperature of the neutral atmosphere. GRA

N75-17556# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A DIGITAL SPECTRAL LIMITER FOR A SYNCHRONOUS MULTIPLE ACCESS SATELLITE COMMUNICATION
Brian E. White 8 Aug. 1974 160 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-A000425; TN-1974-24; ESD-TR-74-238) Avail: NTIS CSCL 17/2

A satellite processing concept for automatically power-balancing the simultaneous accesses of non-cooperative users was investigated. Basically, the scheme consists of a forward and backward fast Fourier transformation with an intermediate clipping operation on spectral magnitudes exceeding an adaptive threshold. The clipper is suitable for applications involving many low-cost mobile terminals where the transmitting terminals need not or cannot pre-correct Doppler shifts or fine timing. As a satellite component preceding a bandpass hard-limiting transponder, the spectral clipper presents an easier alternative to complete in-satellite demodulation of the user signals. Computer simulations of ten pseudorandomly specified users indicate a significant improvement in the performance of the weaker users compared to a hard-limiting transponder. Both an orthogonal block code and a convolutional code with maximum-likelihood decoding were simulated. The spectral-clipping scheme would also be effective with PSK modems and in strong narrowband interference. Implementations composed of 100 integrated circuit packages consuming 10 watts of power are feasible.
Author (GRA)

N75-17557# Army Electronics Command, Fort Monmouth, N.J.
CONVOLUTIONAL DECODER PERFORMANCES ON VHF AND TROPOSCATTER CHANNELS Final Report
Gregory C. Ranieri and John E. Quigley Sep. 1974 97 p refs
(DA Proj. 1S7-62701-AH-92)
(AD-A000670; ECOM-4264) Avail: NTIS CSCL 17/2

Convolutional codes are quite powerful, easily implemented error correcting codes. Decoders for these codes can be probabilistic or deterministic. The primary decoders investigated were the Massey diffuse decoder (fixed, deterministic), the adaptive Gallager decoder (adaptive, deterministic) and the Viterbi decoder (Probabilistic). A limited number of simulations of these decoders were conducted using troposcatter and VHF channel error data. Comparative results and conclusions are discussed.
Author (GRA)

N75-17558# Syracuse Univ., N.Y. Dept. of Electrical and Computer Engineering.
REACTIVELY LOADED DIRECTIVE ANTENNAS
Roger F. Harrington and Joseph R. Mautz Sep. 1974 61 p refs
(Contract N00014-67-A-0378-0006; NR Proj. 371-885)
(AD-A001105; ATR-74-6; TR-1) Avail: NTIS CSCL 09/5

The radiation characteristics of an N-port antenna system can be controlled by impedance loading the ports and feeding only one or a few of them. The use of reactive loads to produce high gain antenna systems is studied. The concept of modal resonance to resonate the real current that produces maximum gain is employed. When the resonated current is the principal contributor to the radiation pattern, then the pattern is almost independent of the position of the feed. This usually requires large coupling between the antenna elements, and can result in supergain antennas. The theory of resonance is extended to include complex port currents and impedance loads. Numerical methods are developed and applied to arrays of linear dipoles arbitrarily disturbed on a plane. Computations are made using both the method of moments and the sinusoidal current approximation. The two methods give similar results. Computer programs are included to allow application of the theory to arrays of the users choice. GRA

N75-17559# Naval Ordnance Lab., White Oak, Md.
FIELDS OF SPIRAL CONFORMAL ARRAYS USING HUGGINS SCANNING AND CONFORMAL FEED NETWORK FOR A CIRCULAR ARRAY
O. J. VanSant and A. D. Krall 9 Oct. 1974 53 p refs
(NOL Proj. F32-342)
(AD-A001268; NOLTR-74-139) Avail: NTIS CSCL 09/5

An array of fan-shaped segments arranged in a spiral-like manner is described. The fan-shaped segment, which may consist of a board of stripline or microstrip, contains several radiating elements phased by the Huggins or I.F. method. The fields produced by single segments are calculated and the characteristics of the radiated beams are given. Quantitative expressions for the field produced by spiral arrays are derived and examples of field patterns and beam properties are given. A method is presented for coupling the outputs of an array of segments to feed a circular array to obtain conformal scanning. When used in this latter manner, the dimensions of an array of segments can be greatly reduced. GRA

N75-17560# Stanford Research Inst., Menlo Park, Calif.
CLOUD COVER VS SIGNAL STRENGTH STUDY Final Report, 28 Jun. 1973 - 28 Jun. 1974
Roy H. Blackmer, Jr. Aug. 1974 60 p refs
(Contract DAEA18-71-A-0204; SRI Proj. 2793)
(AD-A000904) Avail: NTIS CSCL 17/2

Received signal-level data collected on two, 5 GHz European Wide-Band Communication System tropospheric scatter links were compared with satellite viewed cloud cover to determine the correlation that may exist between cloud cover and radio link performance. The results (based on give types of cloud cover) show that tends in signal level are implied by the type of cloud cover over the links although the magnitudes of occasional very high or very low signal levels are underestimated. (Modified author abstract) GRA

N75-17561# Airborne Instruments Lab., Melville, N.Y.
CHEMICAL LADAR INVESTIGATION Final Technical Report, Jan. - Jul. 1974
W. C. Chiou and D. I. Breitzer Aug. 1974 124 p refs
(Contract DAAH01-74-C-0321)
(AD-A000909; AIL-A629-F; RK-CR-75-13) Avail: NTIS CSCL 17/5

The applicability of the high-energy multiline chemical laser to a ladar (laser radar) system is considered. The chemical ladar system is inherently a frequency diversity radar system. For spectrally fluctuating targets the chemical ladar system can extend performance beyond the limit set by an equal power

single-line ladar system. A receiver configuration suitable for the chemical ladar system is conceived, and the resolution and discrimination ability of the multiline ladar is considered. It is shown that the chemical ladar system can perform effective cross-range correlation measurements and doppler spread measurements of spectrally dependent objects. GRA

N75-17562# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
ADAPTIVE FILTERING FOR PRECISION POINTING AND TRACKING PROBLEMS IN WEAPON DELIVERY Technical Report, Oct. 1972 - Mar. 1973
Raymond L. Kolibaba and Robert B. Asher Jan. 1974 94 p refs
(AF Proj. 7629)
(AD-A000043; AFAL-TR-73-320) Avail: NTIS CSCL 17/9

An Adaptive Extended Kalman Filter technique was developed to improve the tracking capabilities of an airborne tracking system. A maneuver determination technique was developed as well as an adaptive technique for the probability model of target acceleration. The computer simulation was run using four different types of data. Computation of the acceleration state was inaccurate due to imprecise modeling of the acceleration states. The adaptive technique reduced the range error of the non-adaptive filter. A maneuver was determined when a bias was detected on the range measurement residual. Author (GRA)

N75-17563# Institute for Telecommunication Sciences and Aeronomy, Boulder, Colo.
PREDICTION OF EUROPEAN RAINFALL AND LINK PERFORMANCE COEFFICIENTS AT 8 TO 30 GHz
E. J. Dutton, H. T. Dougherty, and R. F. Martin, Jr. Aug. 1974 95 p refs Sponsored by Army Communications Command
(SSC Proj. 410-73)
(AD-A000804; ACC-ACO-16-74) Avail: NTIS CSCL 17/2

The Rice-Holmberg prediction model for surface rain rate distributions is extended to the whole of Europe, including the European U.S.S.R. A data base from 249 European stations is used to determine the input parameters for the rainfall prediction model, and rain rate predictions are presented for t-minute periods of an average year in each of the 10 European zones. The mean terrestrial-link performance coefficients, rainfall attenuation rate and rainfall reflectivity, are predicted for the frequency range of 8 to 30 GHz for each of the European rainfall zones. GRA

N75-17564# Harris Corp., Melbourne, Fla. Electronic Systems Div.
MULTIPLE TARGET INSTRUMENTATION RADAR STUDY, PHASE 2 Bimonthly Report, Sep. - Oct. 1974
Duane E. Bowyer 31 Oct. 1974 33 p ref
(Contract N00014-75-C-0033)
(AD-A001074; JA-1543; BMR-1) Avail: NTIS CSCL 17/9

The objective of the study is to develop the logic for the Radar Operating Procedure (ROP), and implement a system simulation to verify the effectiveness of the design. GRA

N75-17565# Army Land Warfare Lab., Aberdeen Proving Ground, Md.
FOLIAGE PENETRATION RADAR: HISTORY AND DEVELOPED TECHNOLOGY Final Report
Louis V. Surgent, Jr. May 1974 155 p refs
(AD-A000805; LWL-TR-74-74) Avail: NTIS CSCL 17/9

The report documents the USA Land Warfare Laboratory's Foliage Penetration Radar program including the historical aspects, the technology developed and four resulting systems that saw combat in Southeast Asia. Application of the FOPEN technology to intrusion detection systems, airborne FOPEN radars, swimmer detection systems, and a radar capable of detecting low flying aircraft concealed by foliage are presented. A review of signal processing techniques and tradeoffs for ground surveillance radars and a summary of propagation research concludes the report. Author (GRA)

N75-17566# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
DIRECTIONAL DOPPLER DETECTION FOR IF-CORRELATOR FM RANGING SYSTEMS USING GENERAL FM MODULATIONS Final Report, 1 Jan. - 31 Dec. 1974
M. C. Bartlett, L. W. Couch, and R. C. Johnson Oct. 1974 41 p refs
(Contract DAAG39-74-C-0039)
(AD-A000829; HDL-TR-039-5) Avail: NTIS CSCL 17/9

A new IF processing technique for obtaining directional Doppler ranging is presented. This technique does not require a specific type of frequency modulation waveform (such as a sawtooth) but may be used with any practical FM waveform. Examples of measured directional Doppler range responses are shown for both a summing circuit and a product circuit for obtaining the directional range law from two quadrature Doppler channels. Author (GRA)

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N75-17567 British Library Lending Div., Boston Spa (England).
THE DIRECTIONAL CHARACTERISTICS OF A LIQUID TUBE TRANSDUCER ANALOGOUS TO THE DIELECTRIC ROD ANTENNA OF RADAR TECHNOLOGY
A. Hasegawa 28 Feb. 1974 19 p refs Transl. into ENGLISH from J. Accoust. Soc. Japan (Japan), v. 26, no. 8, 1970 p 347-356
(BLL-CE-Trans-6159-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The development and characteristics of the liquid-tube transducer for underwater acoustic radiation are discussed. The transducer uses radiation from tube filled with oil in which the velocity of sound is low and excited at one end by a suitable oscillator. The acoustic signal has a slower velocity than the velocity of sound in the free medium and is propagated along the tube. The system radiates a sound wave with sharp axial directivity. Numerical analyses and measurements of the phase velocity of the modal waves in a cylindrical liquid-tube transducer were conducted to determine the axial pressure distribution. Mathematical models of the sound propagation characteristics are included. Author

N75-17568 British Library Lending Div., Boston Spa (England).
ENGINEERING PROBLEMS IN PLANNING AND LAYING OF SUPERCONDUCTING POWDER TRANSMISSION CABLES
H. Heumann 27 Feb. 1974 22 p refs Transl. into ENGLISH from Mitt. der Kabelwerke (West Germany), v. 4, 1972 p 1-7
(BLL-CE-Trans-6228-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The limitations of electric power transmission through conventional transmission lines are described. Methods for improving the transmission capability are analyzed. One method for improving the transmission capability is to reduce the conductor resistance by cooling to a very low temperature. The construction of a direct-voltage cable with superconducting strips is described and an illustration of the component is provided. The dielectric properties of the superconducting cable are reported. The effects of varying the parameters such as the electrode surface, the moisture content of the insulation, the wall thickness, and the type of voltage are summarized. A tabulation of the breakdown strength of different insulating materials at temperatures between 4K and 80K is included. Author

N75-17569 British Library Lending Div., Boston Spa (England).
OPTIMISATION OF AUTOMATIC IMPEDANCE TRANSFORMER PROCESSES, USING AERIAL MATCHING AS AN EXAMPLE
F. Demmel 11 Sep. 1974 13 p Transl. into ENGLISH from NTZ-Nachrtech. Z. (West Germany), v. 27, no. 1, Jan. 1974 p 24-29
(BLL-Trans-894-(9022.64)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The optimization criteria for an impedance transformation process as applied to antenna installations are examined. A system is designed which represents an optimum compromise in the process to provide speed and economic efficiency. The requirement to match the aerial power to the feed line is analyzed and the numerical relationships are established. The most important criterion in the selection of the control are the effects of the antenna base impedance when there is a change in the conditions in the field in a nearby antenna. The basic design of the control arrangement for accomplishing the desired transformation is explained. Diagrams on the control circuit for the automatic tuning of a transmitter antenna are provided. Author

N75-17570 Polish Academy of Sciences, Warsaw.
RADIATION OF AN ACTUATED DIPOLE IN A DISPERSE MEDIUM [PROMIENIOWANIE DIPOLA PORUSZAJACEGO SIE W OSRODKU DYSPERSYJNYM]
Nadiezda Bobrowa 3 Apr. 1973 34 p refs In POLISH
(Rept-15/1973) Avail: NTIS Avail: Issuing Activity

The radiation of an actuated electrical dipole in a disperse medium is discussed. Other topics discussed electromagnetic fields, electrical fields, Fourier transformations, vector analysis, cylindrical bodies, Bessel functions, far fields, and the Poynting theorem. Transl. by M.J.S.

N75-17571 Polish Academy of Sciences, Warsaw.
INTEGRAL EQUATIONS FOR PERIODIC VOLTAGE AND CURRENTS IN NONLINEAR TRANSMISSION LINES [ROWNANIA CALKOWE OKRESOWYCH NAPIEC I PRADOW W NIELINIOWEJ LINII TRANSMISYJNEJ]
Halina Kudrewicz 26 Feb. 1974 28 p refs In POLISH
(Rept-16/1974) Avail: Issuing Acitivity

Periodic solutions are discussed of equations of nonlinear transmission lines during periodic boundary conditions. Existence of periodic solutions for a line with nonlinear longitudinal and transverse resistance, and with linear inductance and capacitance was investigated. Other topics discussed include Laplace transformations, Fourier series, and Hilbert space.
Transl. by M.J.S.

N75-17572# Raytheon Co., Wayland, Mass. Equipment Div.
ASR-5 RADAR DUAL FEEDHORN ANTENNA MODIFICATION. VOLUME 2: DESCRIPTION OF FEASIBILITY EFFORT Final Report, Jun. 1969 - Aug. 1972
P. E. Rawlinson Apr. 1974 120 p refs 2 Vol.
(Contract DOT-FA69WA-2129)
(AD-781349; FAA-RD-74-88-Vol-2) Avail: NTIS HC $4.50

A program to produce separate antenna two-way coverage patterns for the close-in and long range capabilities of the terminal radar system is described. The feedhorn geometry of the ASR-5 antenna was modified by adding a separate receive only feedhorn and polarizer. The close-in coverage was obtained by transmission on the normal (low) beam and reception on the second (high or tilted-up) beam. The long range coverage was obtained by both transmission and reception on the normal beam. This program was divided into two phases. Phase 1 involves the work performed to determine the feasibility of a dual feedhorn configuration to be employed with an ASR-5 antenna. Phase 2 concerns the design and test of the hardware to be delivered to the FAA for evaluation with an ASR-5. The results and conclusions drawn from this program are (1) that the receive-only antenna pattern has an acceptable sidelobe level, azimuth beamwidth, elevation beam shape, and integrated cancellation ratio; (2) that the normal ASR-5 antenna pattern suffers minimal degradation in both linear, and circular polarization; and (3) that a field modification of this system is feasible. Author

N75-17573# Raytheon Co., Wayland, Mass. Equipment Div.
ASR-5 RADAR DUAL FEEDHORN ANTENNA MODIFICATION. VOLUME 1: DESCRIPTION OF HARDWARE AND SUMMARY OF FEASIBILITY EFFORT Final Report, Jun. 1969 - Aug. 1972
P. E. Rawlinson Apr. 1974 144 p refs 2 Vol.
(Contract DOT-FA69WA-2129)
(AD-781348; FAA-RD-74-88-1-Vol-1) Avail: NTIS HC $4.50

Separate antenna two-way coverage patterns were examined for the close-in and long range capabilities of the terminal radar system. The feedhorn geometry of the ASR-5 antenna was modified by adding a separate receive only feedhorn and polarizer. The close-in coverage was obtained by transmission on the normal (low) beam and reception on the second (high or tilted-up) beam. The long range coverage was obtained by both transmission and reception on the normal beam. The results and conclusions drawn from the program are that the receive-only antenna pattern has an acceptable sidelobe level, azimuth beamwidth, elevation beam shape and integrated cancellation ratio; that the normal ASR-5 antenna pattern suffers minimal degradation in both linear and circular polarization; and that a field modification of this system is feasible. Author

N75-17574*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DESIGN GUIDELINES FOR USE OF ADHESIVES AND ORGANIC COATINGS IN HYBRID MICROCIRCUITS
Salvadore V. Caruso, J. J. Licari, K. L. Perkins, and W. A. Schramm Dec. 1974 74 p Prepared in cooperation with Rockwell Intern., Autonetics Div.
(Contract NAS8-26384)
(NASA-TM-X-64908) Avail: NTIS HC $4.25 CSCL 09/1

A study was conducted to investigate the reliability of organic adhesives in hybrid microcircuits. The objectives were twofold: (1) to identify and investigate problem areas that could result from the use of organic adhesives and (2) to develop evaluation tests to quantify the extent to which these problems occur for commercially available adhesives. Efforts were focused on electrically conductive adhesives. Also, a study was made to evaluate selected organic coatings for contamination protection for hybrid microcircuits. Author

N75-17575# Australian Post Office Research Labs., Melbourne.
IMPROVED TEST FIXTURE FOR MICROWAVE TRANSISTOR
L. F. Lind Jun. 1974 7 p
(Rept-6912) Avail: NTIS HC $3.25

A mounting technique is developed which allows for reuse of microwave transistors. Apart from the cost savings, many other important benefits are obtained as a result of this technique. Author

N75-17576# Australian Post Office Research Labs., Melbourne.
SENSITIVITY ANALYSIS OF INTERSTAGE MATCHING NETWORKS
L. F. Lind Jun. 1974 11 p
(Rept-6913) Avail: NTIS HC $3.25

A sensitivity equation was developed for interstage matching networks employed in microwave amplifiers. A particular design, utilising field effect transistors is cited, and the relationships controlling the degree of interstage and sensitivity to device variations examined. Author

N75-17577*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIGITAL PHASE-LOCKED-LOOP SPEED SENSOR FOR ACCURACY IMPROVEMENT IN ANALOG SPEED CONTROLS
Arthur G. Birchenough Washington Mar. 1975 12 p refs
(NASA-TM-X-3200; E-8167) Avail: NTIS HC $3.25 CSCL 09E

A digital speed control that can be combined with a proportional analog controller is described. The stability and transient response of the analog controller were retained and combined with the long-term accuracy of a crystal-controlled integral controller. A relatively simple circuit was developed by using phase-locked-loop techniques and total error storage. The integral digital controller will maintain speed control accuracy equal to that of the crystal reference oscillator. Author

N75-17578# Brookhaven National Lab., Upton, N.Y.
BNL MATERIALS RESEARCH FOR AN AC SUPERCONDUCTING POWER TRANSMISSION CABLE
D. H. Gurinsky 1 Apr. 1974 36 p refs Presented at the Program Exchange for Brookhaven and USSR Transmission Line Work Meeting, Washington, D. C., 8 Apr. 1974 Sponsored by AEC and NSF
(BNL-18762) Avail: NTIS HC $3.75

A program to improve the superconductors for alternating

current superconducting power transmission applications is discussed. It was concluded that the A-15 superconductor Nb3Sn showed the greatest promise of meeting the requirements for a transmission cable since it had a high critical temperature, critical current, and critical field. These properties permit higher operating temperatures (6 to 8K) with lower refrigeration costs and single phase helium cooling. The high critical temperature is also desirable to cope with fault conditions which may arise in an operating transmission line. The following subjects are considered: (1) methods used in the manufacture of Nb3Sn tape superconductor, (2) metallurgical considerations in the manufacture of the tape, (3) alternating current loss measurement, and (4) a design of a conductor for cable production. Author

N75-17579# Los Alamos Scientific Lab., N.Mex.
USAEC-DAT DC SUPERCONDUCTING POWER TRANSMISSION LINE PROJECT AT LASL Progress Report, 1 Jan. - 31 Mar. 1974
W. E. Keller, comp. and R. D. Taylor, comp. Jul. 1974 19 p refs
(Contract W-7405-eng-36)
(LA-5684-PR) Avail: NTIS HC $3.25

A small tube covered by two layers of commercial Nb3Sn tapes carried a current of about 39,000 A introduced by a dc transformer technique. Critical current tests in the range 13.8 to 17 K are reported for several Nb3Sn tapes of varying width. At 13.8 K some tapes carried over 25% of their 4 K critical current. Operation of the 20-m test bed with a NbTi sample at 4 K and carrying 10,000 A is described. Superconducting materials developments include thick, chemical-vapor-deposition prepared Nb3Ge coatings having at T sub c of 16 K. Author (NSA)

N75-17580# Sandia Labs., Albuquerque, N.Mex.
RF HYBRID MICROCIRCUIT SOLDERING TECHNIQUES
H. C. Olson and G. L. Knauss Aug. 1974 44 p refs
(Contract AT(29-1)-789)
(SLA-73-1073) Avail: NTIS HC $3.75

Progress on the development of hybrid microcircuit technology is described. To minimize the inductance caused by flying wires it was desirable to attach most applique parts to the hybrid circuits using a solder alloy. The hybrid circuits have 60 kA of gold as the metallization to which the applique parts are attached. The solder development activities, equipment, and assembly techniques using a 50%, by weight, lead-indium solder alloy are described. Author (NSA)

N75-17581# Argonne National Lab., Ill.
PROTECTION CIRCUIT FOR A LIQUID-NITROGEN TRAP FILLER
R. G. Scott Jul. 1974 4 p
(Contract W-31-109-eng-38)
(ANL-8111) Avail: NTIS HC $3.25

A simple circuit is described that substitutes a timed fill for a demand fill in the event of sensor or fill-tube failure thereby avoiding damage and unnecessary shutdown of the system. Author (NSA)

N75-17582# Bendix Corp., Kansas City, Mo.
MASS ANODIZATION OF TANTALUM-NITRIDE RESISTORS
A. J. Peltier Sep. 1974 24 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-1155-Rev) Avail: NTIS HC $3.25

Mass anodization of tantalum-nitride films with sheet resistivities not exceeding 200 ohms per square to meet + or - 10% tolerance requirements on resistors above 100 ohms has been shown feasible. The anodization system that was developed for this study is capable of producing yields of approximately 80% under those conditions. Although anodization trimming on films with sheet resistivities as high as 600 ohms per square is now feasible, further work is necessary to successfully anodize films above 600 ohms per square and resistors below 100 ohms. The work was done to establish a method of anodizing tantalum nitride resistor films on microcircuit substrates. Author (NSA)

N75-17583# Bendix Corp., Kansas City, Mo.
DEVELOPMENT OF PROCESSES FOR HYBRID MICROCIRCUITS CONTAINING BEAM-LEAD DEVICES
R. J. Blazek and J. N. Blakely Aug. 1974 157 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-1115-Rev) Avail: NTIS HC $6.25

The process development and prove-in work of this program established a complete technology for manufacturing hybrid microcircuits containing beam lead devices. Previous microcircuits contained chip and wire semiconductors. The principal contributions of this work to the existing microcircuit technology were a thermocompression bonding process to bond the gold beam leads and lead frames to the microcircuit substrate and the precision process controls necessary to ensure adequate pull strength on bonds that cannot be nondestructively tested. Other pertinent processes also were refined as needed to provide high microcircuit reliability. These processes and techniques have been released for use in manufacturing seven types of microcircuits for a coded electronic switch. Author (NSA)

N75-17584# Bendix Corp., Kansas City, Mo.
DETECTION AND SUPPRESSION OF TRANSISTOR OSCILLATION DURING POWER BURN-IN
R. W. Schmitt Sep. 1974 35 p Revised
(Contract AT(29-1)-613)
(BDX-613-1144-Rev) Avail: NTIS HC $3.75

A method was developed for suppressing parasitic oscillation of transistors operating under test conditions through the use of ferrite cores and capacitors. The Hewlett-Packard Model 8554L spectrum analyzer is recommended for detecting unknown RF noise. Author (NSA)

N75-17585# California Univ., Berkeley. Electronics Research Lab.
STUDY OF BULK TRAPPING EFFECTS IN RADIATION-RESISTENCE MOS DEVICES Final Report, 30 Jun. 1972 - 31 Dec. 1973
William G. Oldham May 1974 33 p refs
(Contract F19628-72-C-0215; AF Proj. 6096)
(AD-786419; AFCRL-TR-74-0224) Avail: NTIS CSCL 09/1

The properties of MOS transistors are examined before and after exposure to large neutron fluences. The effect is concentrated on three phenomena, judged to be the most serious limitations on ultimate device hardness: (1) Trapping of carriers in radiation induced deep levels (2) degradation of the mobility of carriers in the channel, and (3) punch-through from drain to source. Data are obtained on three classes of devices (1) hardened MOS transistors manufactured by Hughes (2) MOS transistors manufactured at Siliconiz, and (3) several special vertical pnp and npn structures. (Modified author abstract) GRA

N75-17586# Army Electronics Command, Fort Monmouth, N.J.
MASS-LOADING EFFECTS ON CRYSTAL RESONATORS EXCITED BY THICKNESS ELECTRIC FIELDS
Arthur Ballato and Theodore Lukaszek Oct. 1974 80 p
(DA Proj. 1S7-62705-AH-94)
(AD-A000672; ECOM-4270) Avail: NTIS CSCL 09/1

The report treats a single-mode resonator plate with equal mass coatings on its surfaces and excited by an electric field in the thickness direction. The usual restriction to low piezoelectric coupling coefficient is not made. From simple considerations regarding the equivalent network, the exact equations for the critical frequencies of interest are shown to follow directly. These are used throughout without approximation and solved numerically. Use of the exact relations allows high coupling materials to be covered as easily as low. Families of curves showing the variations of the resonance and antiresonance frequencies over a wide range of values of mass-loading, coupling coefficient and harmonic number are given. A new plateback parameter, valid for all piezoelectric substances, is also introduced. Author (GRA)

N75-17587# Army Foreign Science and Technology Center, Charlottesville, Va.
ASSIGNMENT OF NONLINEAR BOUNDARY CONDITIONS OF THE THIRD TYPE ON MODELS MADE OF ELECTROCONDUCTIVE PAPER
Yu. M. Matsevityi 25 Feb. 1974 12 p refs Transl. into ENGLISH from Energ. Mashinostr. (USSR), no. 7, 1968

p 27-31
(AD-A000212; FSTC-HT-23-1599-73) Avail: NTIS CSCL 20/13

In order to widen the capabilities of electric integrators of the EGDA type as well as with the goal of spreading the method of nonlinear resistances into models that are made out of electrically conductive sheets, the authors conducted studies which are associated with the discrete assignment of boundary conditions on models-continuum. The results of a study for the explanation of the width of the zone of distortion, its resistance, and at the same time for an account of the change of the resistance of the whole model, permit giving recommendations for the selection of the parameters of the model. GRA

N75-17588# Army Foreign Science and Technology Center, Charlottesville, Va.
CONVERTOR UNIT WITH A THYRISTOR ON-OFF SWITCH AND ELECTRONIC SHIELDING
N. A. Karsh and G. M. Rubashov 26 Jun. 1974 14 p refs Transl. into ENGLISH from Elektrosnab. Avtomat. Ustroestv. Electri. Tyagi Sbor (Leningrad), v. 218, 1970 p 3-12
(AD-A000232; FSTC-HT-23-173-74) Avail: NTIS CSCL 10/2

A converter unit with a thyristor on-off switch and electronic shielding is described. Performance curves and a wiring diagram are presented. The unit permits a reduction in the number of gates and in dimensions, has a sensitivity of about 0.3 of the rated trigger current and a speed of action of 1-2 msec, considerable improvement over existing systems. The system is operating in the traction circuits of the Leningrad Subway System. GRA

N75-17589# Army Foreign Science and Technology Center, Charlottesville, Va.
SYNTHESIS OF ANTENNAS ON THE BASIS OF EXPERIMENTAL DATA
V. N. Dymskii, A. M. Gavrilov, V. N. Mizgailov, G. A. Morozov, and Yu. I. Choni 3 Apr. 1974 15 p refs Transl. into ENGLISH from Tr. Aviats. Inst. (Kazan), no. 104, 1970 p 19-28
(AD-A000225; FSTC-HT-23-1781-73) Avail: NTIS CSCL 09/1

Methods of constructing antennas based on experimental data of radiation patterns are analyzed. The physical interpretation of complex-domain operators in the theory of antennas synthesis is given. The application emphasized is designing antennas for placement near bodies of complex geometrical configuration when theoretical calculation of diffraction phenomena in the electromagnetic field is difficult. GRA

N75-17590# Army Electronics Command, Fort Monmouth, N.J.
DEVELOPMENT OF CAMOUFLAGED VEHICULAR VHF ANTENNAS Final Report, Jun. - Sep. 1974
Edward Shaffer and Kurt Ikrath Sep. 1974 43 p
(DA Proj. 1T1-61102-B-31A)
(AD-A000659; ECOM-4261) Avail: NTIS CSCL 09/5

The use of hybrid electromagnetic coupling (HEMAC) couplers on vehicles at VHF is promising, as shown herein. Most tests of HEMAC coupled vehicles were made using PRC-25 Transceivers within a 3/4-mile radius and indicate that some configurations, notably the 10-coil array, are nearly as effective as a whip antenna for communication purposes. However, the most flexible and feasible configuration developed to date is the vehicular doorslot antenna, mostly due to its simplicity of design and tuning characteristics. The doorslot antenna powered by a VRC-12 Transceiver has been tested thus far within a 7-mile range and found to be effective. The practical implementation of the slot antenna to use on metal shelters, trucks, and armored vehicles appears to be relatively simple. (Modified author abstract) GRA

N75-17591# Environmental Protection Agency, Silver Spring, Md. Electromagnetic Radiation Analysis Branch.
RF PULSE SPECTRAL MEASUREMENTS IN THE VICINITY OF SEVERAL AIR TRAFFIC CONTROL RADARS Final Report
Richard A. Tell and John C. Nelson May 1974 53 p refs
(PB-235733/3; EPA/520/1-74-005) Avail: NTIS HC $4.25 CSCL 17I

This study was to determine the response characteristics of a microwave scanning spectrum analyzer in the presence of a relatively intense and complex electromagnetic environment. Measurements were taken of ambient field intensities in the vicinity of three different ground radars used in air traffic control operations. GRA

N75-17592# Radio Corp. of America, Harrison, N.J. Microwave Devices Operations Dept.
A PRODUCTION ENGINEERING MEASURE FOR TWO L-BAND SOLID-STATE MICROWAVE FREQUENCY SOURCES Quarterly Report, 1 May - 31 Jul. 1974
Daniel D. Mawhinney, Frank E. Vaccaro, and Brian Dornan 23 Aug. 1974 39 p refs
(Contract DAAB05-72-C-5830)
(AD-A001562; ECR-428-10; QR-10) Avail: NTIS CSCL 09/5

A Production Engineering Measure (PEM) for two L-Band Solid-State Microwave Frequency Sources was continued. These two devices are a Radiosonde Modulator/Transmitter and an FM Power Source. The Pilot Production run of 500 Radiosonde units was completed during this report period. An excellent production yield was obtained and no major problems were encountered. The 500 units were delivered to complete all work on the Radiosonde Modulator/Transmitter (Unit A). First Article testing of the FM Power Source was successfully completed during this period and the test report is being prepared. Plans have been made for the pilot production run of 500 units. GRA

N75-17593# Cincinnati Electronics Corp., Ohio.
HIGH EFFICIENCY LINEAR SSB POWER AMPLIFIER Final Report, Jul. 1971 - Mar. 1974
C. M. Morris, E. R. Parsons, and F. H. Raab Aug. 1974 169 p refs
(Contract DAAB07-71-C-0220)
(AD-A001547; Rept-80045-TRC-17/874; ECOM-0220-F-71) Avail: NTIS CSCL 09/5

The report describes the development of two exploratory compact, lightweight models of a 2-30 MHz High Efficiency Linear SSB Power Amplifier System. GRA

N75-17594# Silicon Transistor Corp., Chelmsford, Mass.
PRODUCTION ENGINEERING MEASUREMENT FOR HIGH CURRENT FAST-SWITCHING TRANSISTORS Quarterly Progress Report, 19 Apr. - 19 Jul. 1974
Frederick G. Ernick Sep. 1974 13 p
(Contract DAAB05-73-C-2032)
(AD-A000836; QPR-6) Avail: NTIS CSCL 09/1

During the period a lot was processed through Government Source Inspected pre-cap visual inspection. However, the lot failed Group A testing. The major cause for rejection was failure to meet the high current beta specifications. Reasons for failure are discussed. Author (GRA)

N75-17595# Raytheon Co., Waltham, Mass. Microwave and Power Tube Div.
DEVELOPMENT OF A PROTOTYPE FERRITE TUNED MAGNETRON, QKH1707 Final Report, 1 Sep. 1973 - 31 Aug. 1974
John Butler and Sumner B. Besse Sep. 1974 48 p
(Contract N00039-73-C-0080)
(AD-A000261; PT-4287) Avail: NTIS CSCL 09/1

The QKH1707 program concerned the design of a prototype ferrite-tuned, Ku-band coaxial magnetron. The tuner developed for this program is a ferrite-loaded, variable-reactance transmission line coupled to the coaxial cavity of the magnetron. The propagation constant of the line is changed and the magnetron is tuned by controlling the magnetic field through the ferrite. This electronic tuning is much faster than mechanical tuning and has a potentially broader bandwidth. Circularly polarized rf fields in the ferrite contribute to the broader tuning range. Cold tests indicated that a 1-1/2% bandwidth could be achieved. Construction and test of an operational ferrite phase shifter have shown that the ferrite tuning concept applied to a coaxial magnetron is a valid and feasible means of obtaining electronic tuning. Author (GRA)

N75-17596# Office of Naval Research, Arlington, Va.
NOISE IN JOSEPHSON POINT CONTACTS WITH AND WITHOUT RF BIAS
J. H. Claassen, Y. Taur, and P. L. Richards Aug. 1974 15 p

refs
(Contract N00014-69-A-0200-1056)
(AD-A001029) Avail: NTIS CSCL 09/5

Point contact Josephson junctions operated as microwave mixers at 36 GHz show conversion gain and lower noise than cooled Schottky barrier diodes in the same application. The noise in such junctions with and without rf bias is explored both experimentally and theoretically. The noise power is found to be about a factor 2 above the thermal noise in the resistively shunted junction model. In contrast to previous reports, the inclusion of a shot noise term in the theory for no rf bias overestimates the observed noise substantially. Author (GRA)

N75-17597# California Univ., Berkeley. Dept. of Physics.
JOSEPHSON JUNCTIONS AS HETERODYNE DETECTORS
Y. Taur, J. H. Claassen, and P. L. Richards Aug. 1974 24 p refs Presented at the Intern. Conf. on Submillimeter Waves and their Appl. (1st), Atlanta, Jun. 1974
(Contract N00014-69-A-0200-1056)
(AD-A001028) Avail: NTIS CSCL 09/5

Heterodyne detection with a point contact Josephson junction was investigated both experimentally and theoretically. The measured performance of the device at 36 GHz is in good agreement with the theory. By operating vanadium point contacts at 1.4K, the authors have achieved a single side band mixer noise temperature of 54K with a conversion gain of 1.35 and a signal bandwidth of the order of 1GHz. From the results one can extrapolate a potentially impressive performance for these devices at submillimeter wavelengths. (Modified author abstract) GRA

N75-17598# California Univ., Berkeley. Dept. of Physics.
RELAXATION OSCILLATIONS IN POINT CONTACT JOSEPHSON JUNCTIONS
Y. Taur and P. L. Richards Sep. 1974 22 p refs
(Contract N00014-69-A-0200-1056)
(AD-A001030) Avail: NTIS CSCL 09/5

Negative resistance regions have been observed on the static I sub o-V sub o curves of point contact Josephson junctions when dc biased with a low impedance source. An equivalent circuit model has been developed which successfully explains the experimental results in terms of relaxation oscillations. It is also found that such junctions can be operated either as a one-port amplifier for signals at 5 MHz, or as a 36 GHz heterodyne mixer with large conversion gain. GRA

N75-17599# Raytheon Co., Waltham, Mass. Special Microwave Devices Operation.
MILLIMETER WAVE AVALANCHE TRANSMIT TIME DIODE AMPLIFIER Final Report, 1 Jul. 1972 - 30 Jan. 1974
R. Fekete and C. W. Lee Sep. 1974 93 p refs
(Contract DAAB07-72-C-0228)
(AD-A001545; SM-438; ECOM-72-0228-F; Rept-0174-859) Avail: NTIS CSCL 09/5

Millimeter wave avalanche diodes and avalanche diode amplifiers (ADAs) were investigated. Epitaxial GaAs material were fabricated. The device development program resulted in diodes with over 400 milliwatts output power. Several single stage ADAs have been designed, built and tested. Non-linear effects in the amplifiers at high power operation were investigated. At the conclusion of the program, two 2-stage ADAs were constructed. When the amplifiers were integrated into a single 4-stage ADA, 17 db gain with 250 milliwatt output power has been obtained. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N75-17600 British Library Lending Div., Boston Spa (England).
ANALYSING THE TEMPERATURE FIELD IN AN ASYMMETRICAL SOLID HEATED CYLINDER
M. K. Kleiner and V. G. Tur 1974 13 p refs Transl. into ENGLISH from Izv. Vyssh. ucheb. Zaved., Chern. Met. (USSR), v. 3, 1974 p 149-153 In ENGLISH and RUSSIAN
(BLL-M-21988-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Features of the temperature field in an asymmetrical solid heated cylinder are found on the basis of solving the two-dimensional thermal conductivity equation with variations in the flow of heat into the side surface of the cylinder. Expressions are obtained for determining the coordinates of the point with the minimum temperature. It is proved that the coefficient of asymmetry of heating depends on the relative distance between cylinders. The isotherms for regular conditions are in the form of an ellipse rather than a circle. The procedure for determining the coefficient of asymmetry of heating is based on the distribution of temperatures in the cylinder in the form of a parabolic ellipsoid. Author

N75-17601 British Library Lending Div., Boston Spa (England).
THE THEORY OF THE REACTIVE FAN. PART 1: CONSTRUCTION TYPES, OPERATING CHARACTERISTICS, FLOW PATTERN, VELOCITY FIELDS
T. Lajos and L. Preszler 11 Nov. 1974 37 p refs Transl. into ENGLISH from Heiz. Luft Haustechn. (West Germany), v. 24, no. 5, 1973 p 134-140
(BLL-NEL-TT-2597-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

The development and present applications of the reactive fan is outlined. The flow field is defined by the superposition of (1) the velocity field of the turbulent-free normal flow, (2) the velocity field of the turbulence distribution replaced by the blade, and (3) the velocity field of the flowing-away turbulence due to the blade circulation change. Differential equations which describe the flow field are provided. N.E.R.

N75-17602 British Library Lending Div., Boston Spa (England).
EFFECT OF GAS FLOW RETARDATION IN THE EXHAUST PART OF AN ARC-EXTINGUISHER BLAST SYSTEM ON ARC PARAMETERS
G. A. Kukevov, G. S. Kaplan, and L. S. Vetyukova 4 Mar. 1974 8 p refs Transl. into ENGLISH from Elektrichestvo (USSR), no. 7, 1970 p 35-37
(BLL-CE-Trans-5984-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The expulsion of hot ionized air from the blast region of an air blast circuit breaker was investigated in an extinction system with single-ended longitudinal blast. The blast system of the arc-extinction chamber was also studied. It was concluded that (1) The character of complex gas dynamic processes taking place in a blast system can be investigated on a geometrical model of the system. (2) The deceleration of the gas flow in the exhaust part of the system has an effect on the parameters of the arc, and on the character of the variation of voltage and the voltage gradient in the arc. F.O.S.

N75-17603 British Library Lending Div., Boston Spa (England).
EVALUATION TECHNIQUES OF GASEOUS DIFFUSION FLOWS IN POROUS SOLIDS (EXTRACTS)
G. Greco, Jr. 27 Feb. 1974 19 p Transl. into ENGLISH from Ing. Chim. Ital. (Milan), v. 8, no. 10, Oct. 1972 p 225-231
(BLL-CE-Trans-6232-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Methods for determining the diffusion flows of gases in porous solids are discussed. They are compared in terms of their ability to correlate experimental data obtained from steady-state diffusion tests on porous solids of different structures using various pairs of gases. Author

N75-17604 Politecnico di Torino (Italy).
EFFECTS OF NONEQUILIBRIUM PHENOMENA ON THE STRUCTURE OF A STRONG NORMAL SHOCK WAVE
Maria S. Oggiano and Michele Onorato 1973 13 p refs Repr. from Recent Develop. in Shock Tube Res., 1973 p 761-772
(Rept-638) Copyright. Avail: Issuing Activity

The structure of a strong normal shock wave in a monatomic ionizing gas is analysed. A three-level atom model is adopted

to describe nonequilibrium effects due to collisional atom excitation and to radiative and collisional ionization. Two different temperatures are considered, one for the heavy particles, and one for the electrons. Results obtained by applying an asymptotic layering method are confirmed by fully numerical calculations. In addition the influence of the electron thermal conductivity on the shock structure is estimated. Author

N75-17605 Polytechnic Inst. of Brooklyn, N.Y.
TRANSVERSE CURVATURE EFFECTS IN HIGH REYNOLDS NUMBER FLOWS Ph.D. Thesis
Frank John Mummolo 1974 105 p
Avail: Univ. Microfilms Order No. 74-22488

The three-dimensional, high Reynolds number viscous flow about a semi-infinite cylinder of elliptic cross section is considered. The method of matched asymptotic expansions is used to formulate the boundary layer and potential flow problems. The concepts of inviscid slender body theory are examined. This method is shown to be applicable when small perturbation theory applies and when the Reynolds number is large so that the thin boundary layer assumption is valid. The resulting potential problem is reduced to a two-dimensional consideration of the flow over an expanding cylinder with porous boundary conditions. For cross sections of moderate eccentricity, the boundary layer problem is formulated by means of a double expansion in Reynolds number and eccentricity. The effects of uniform curvature, displacement, and nonaxisymmetry are isolated and discussed. For cross sections of high eccentricity, a momentum integral method is employed to estimate the boundary layer displacement thickness, and the boundary layer induced cross flow is evaluated. The limiting behavior as e yields 1 is discussed. Dissert. Abstr.

N75-17606*# Illinois Inst. of Tech., Chicago.
TURBULENCE COEFFICIENTS AND STABILITY STUDIES FOR THE COAXIAL FLOW OR DISSIMILIAR FLUIDS Final Report, Jun. 1964 - Aug. 1974
Herbert Weinstein and Z. Lavan Feb. 1975 232 p refs
(Grant NGR-14-004-008)
(NASA-CR-142198) Avail: NTIS HC $7.50 CSCL 20D

Analytical investigations of fluid dynamics problems of relevance to the gaseous core nuclear reactor program are presented. The vortex type flow which appears in the nuclear light bulb concept is analyzed along with the fluid flow in the fuel inlet region for the coaxial flow gaseous core nuclear reactor concept. The development of numerical methods for the solution of the Navier-Stokes equations for appropriate geometries is extended to the case of rotating flows and almost completes the gas core program requirements in this area. The investigations demonstrate that the conceptual design of the coaxial flow reactor needs further development. For individual titles, see N75-17607 through N75-17608.

N75-17607* Illinois Inst. of Tech., Chicago.
INVESTIGATION A: NUMERICAL SOLUTIONS OF DRIVEN VORTICES OF BINARY FLUID IN A CYLINDRICAL GEOMETRY
Yong Woo Shin and Zalman Lavan *In its* Turbulence Coefficients and Stability Studies for the Coaxial flow or Dissimiliar Fluids Feb. 1975 146 p refs (For availability see N75-17606 09-34)
CSCL 20D

The steady state laminar motion of a viscous, incompressible and binary fluid is studied for a rotating flow in a cylindrical geometry. The mathematical model employed is a cold flow simulation of the fluid mechanics of the light-bulb concept of the gaseous core nuclear engine. A numerical treatment is developed for the rotating flow which includes a description of the nuclear fuel addition. The problem is formulated with the complete Navier-Stokes equations in order to show the interaction between the fuel addition, the main flow, and the boundary layer flow in an accurate manner. The results presented show holdup of the nuclear fuel for the case of steady fuel addition. Author

N75-17608* Illinois Inst. of Tech., Chicago.
INVESTIGATION B: LAMINAR CONFINED COAXIAL ENTRANCE FLOW WITH HEAT GENERATION
Gopala Krishna Murty Bobba and Herbert Weinstein *In its* Turbulence Coefficients and Stability Studies for the Coaxial Flow or Dissimiliar Fluids Feb. 1975 76 p refs (For availability see N75-17606 09-34)
CSCL 20D

The results of a parametric study on the entrance flow region in a gas core nuclear reactor are presented. The physical system is modeled as laminar confined, coaxial flow with heat generation in the inner fluid. The governing equations include the boundary layer approximations and the assumptions of only radial radiative transport of energy represented as an energy diffusion term. The Von Mises transformation and a zeta transformation are used to transform the equations into nonlinear nonhomogeneous convective-diffusion equations. A unique combination of forward and backward difference equations which yields accurate results at moderate computational times, is used in the numerical method. Results show that the rapidly accelerating, heat generating inner stream actually shrinks in radius as it expands axially. Author

N75-17609# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
THE PHENOMENOLOGICAL THEORY OF THERMODYNAMIC COUPLING IN MULTICOMPONENT COMPRESSIBLE LAMINAR BOUNDARY-LAYERS
Yoram Tambour and Benjamin Gal-or Jul. 1974 36 p refs
(TAE-220) Avail: NTIS HC $3.75

Thermodynamic couplings due to thermal diffusion, diffusion-thermo, and ob aliam diffusion effects in multicomponent compressible laminar boundary-layers and in stagnation-point flows with blowing or suction, are analyzed, and compared with other available analyses for simpler specific cases. The mathematical treatment includes new definitions of generalized Prandtl, Lewis and Schmidt numbers for coupled heat and multicomponent mass transfer. Using matrix notation and introducing new transformations, the energy and the species conservations equations are decoupled and transformed into a widely useful single compact energy species equations. For frozen multicomponent boundary-layer flows, the generalized energy-species equation is of the same form as the energy equation for the simplest case, i.e. the energy equation in terms of total enthalpy for single-component-boundary-layer flows in the absence of thermodynamic coupling. Hence solutions for generalized flows, which are presented in transformed forms, are obtaineable from known solutions of the 'simpler' cases. Similar solutions of coupled heat transfer at the stagnation point with and without blowing or suction are analyzed. Author

N75-17610# National Aerospace Lab., Tokyo (Japan).
POTENTIAL FLOW FIELD INDUCED BY RING VORTEX AND SOURCE LINE IN A CYLINDRICAL ANNULUS
Atsuhiro Tamura 1974 18 p refs In JAPANESE; ENGLISH abstract
(NAL-TR-375) Avail: NTIS HC $3.25

The analytic solutions of the irrotational flow field induced by a ring vortex line or ring source line of constant strength and a ring source line of variable strength in a cylindrical annulus were obtained. In the limit as hub diameter vanishes, the solutions are identical with the analyses of the flow field in a cylindrical duct. The flow field due to a ring doublet or disc source in a cylindrical annulus can be solved. Author

N75-17611*# Florida Univ., Gainesville. Dept. of Engineering Sciences.
A MODEL FOR THE VORTEX PAIR ASSOCIATED WITH A JET IN A CROSS FLOW M.S. Thesis
William L. Sellers, III 1975 87 p refs
(Grant NGR-10-005-127)
(NASA-CR-136756) Avail: NTIS HC $4.75 CSCL 20D

A model is presented for the contrarotating vortex pair that is formed by a round, turbulent, subsonic jet directed normally into a uniform, subsonic cross flow. The model consists of a set of algebraic equations that describe the properties of the vortex pair as a function of their location in the jet plume. The parameters of the model are physical characteristics of the vortices such as the vortex strength, spacing, and core size. These parameters are determined by velocity measurements at selective points in the jet plume. Author

N75-17612*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ON THE KERNEL FUNCTION FOR THE UNSTEADY SUPERSONIC CASCADE WITH SUBSONIC LEADING EDGE LOCUS
M. E. Goldstein Feb. 1975 21 p refs
(NASA-TM-X-71673; E-8220) Avail: NTIS HC $3.25 CSCL 20D

A function integral equation governing the unsteady motion of a supersonic cascade is derived. Various representations of the Kernel function are derived and discussed. Author

N75-17613# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
DISSIPATION OF TURBULENT ENERGY IN A NATURAL CHANNEL
D. I. Grinvald and M. I. Zheleznyak 1974 13 p refs Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), v. 13, no. 7, 1971 p 50-55
(NRC/CNR-TT-1782) Avail: NTIS HC $3.25

An effort was made to apply the Kolmogorov-Obukhov theory of locally isotropic turbulence to the study of turbulence in natural rivers. The inertial subrange was indicated and the limits were determined within which the 2/3 and -5/3 laws were fulfilled. Empirical time structural, correlative and spectral functions of the longitudinal velocity component were computed. For the first time the velocities of energy dissipation for natural streams were calculated directly from those functions. Author

N75-17614*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
SKIN FRICTION REDUCTION IN SUPERSONIC FLOW BY INJECTION THROUGH SLOTS, POROUS SECTIONS AND COMBINATIONS OF THE TWO Final Report
Joseph A. Schetz and Johannes VanOvereem Washington NASA Mar. 1975 62 p refs
(Grant NGR-47-004-160)
(NASA-CR-2491) Avail: NTIS HC $4.25 CSCL 20D

An experimental study of skin friction reduction in a Mach 3.0 air steam with gaseous injection through a tangential slot, a porous wall section, and combinations of the two was conducted. The primary data obtained were wall shear values measured directly with a floating element balance and also inferred from Preston Tube measurements. Detailed profiles at several axial stations, wall pressure distributions and schlieren photographs are presented. The data indicate that a slot provides the greatest skin friction reduction in comparison with a reference flat plate experiment. The porous wall section arrangement suffers from an apparent roughness-induced rise in skin friction at low injection rates compared to the flat plate. The combination schemes demonstrated a potential for gain. Author

N75-17615# Sandia Labs., Livermore, Calif.
GAS-TRANSFER ANALYSIS. SECTION B: PSEUDO-POLYTROPIC EXPANSION OF A PERFECT GAS
D. R. Chenoweth Sep. 1974 33 p refs
(Contract AT(29-1)-789)
(SAND-74-8212) Avail: NTIS HC $3.75

A definition is given of the empirical coefficients n, lambda, and C sub d, and a gas-transfer theory is formulated when they are all time-dependent. The local value of the time-average is shown to be important. The limiting cases of an adiabatic and an isothermal supply reservoir are contained in these results. Two measures of the possible effects of coupling of supply reservoir heat transfer with lambda C sub d are described for use with experimental data to determine the extent of validity of two important simplifying assumptions. Author (NSA)

N75-17616# Detonics Corp., Seattle, Wash.
CHEMICAL HEAT SOURCES Final Report
[1974] 79 p Sponsored by AEC Prepared for California Univ., Livermore. Lawrence Livermore Lab.
(UCRL-13601) Avail: NTIS HC $4.75

Work was undertaken to identify chemical heat sources which can being a metal such as aluminum contained in a tantalum vessel from ambient to 1500C. Five different fuels and twelve different oxidizers were identified as potential components in a mixture possessed of the desired characteristics: large amount of heat available at 2000K, good good heat transfer characteristics, insensitivity, long term stability, and no reaction products boiling below 1800K. Six mixtures were selected for additional tests on the basis of: (1) usefulness in the device, itself and (2) usefulness in characterizing other mixtures in the same class. The results are: All mixtures are dry, non-hygroscopic, non-pyrophoric powders which are stable, non-corrosive, and insensitive (ignition temperatures above 380C) yet they are ignited easily and reliably by standard means. All mixtures may be pressed in place, without binders, to form relatively tough solids. The information now available is sufficient to begin development of one or more prototype devices. Author (NSA)

N75-17617# United Kingdom Atomic Energy Authority, Harwell (England).
MEASUREMENTS OF THREE VELOCITY COMPONENTS AND THEIR CORRELATIONS IN A MODEL FURNACE WITH AND WITHOUT COMBUSTION
R. J. Baker, P. Hutchison, E. E. Khalil, and J. H. Whitelaw Jul. 1974 16 p refs
(AERE-R-7776) Avail: AEC Depository Libraries HC $4.00

Measured values of three components of mean velocity and the corresponding normal stresses are reported in the flow within an enclosure which is representative of a small-scale furnace with an axisymmetric, swirling flow configuration. The measurements were obtained in isothermal air flow and in a combusting mixture of air and natural gas: exit swirl numbers of zero and 0.52 were investigated for both the isothermal and combusting cases. The flow configuration was that of a cylindrical chamber, 900 mm long by 300 mm in diameter. At one end, the chamber was closed except for a co-axial burner nozzle with annulus and jet dimensions of 55 mm outside diameter, 27 mm inside diameter and 12 mm jet diameter. At the other end, the chamber was closed except for a central hole of 90 mm diameter through which the air or combustion products flowed to exhaust.
Author (NSA)

N75-17618# European Space Research Organization, Paris (France).
NUMERICAL SOLUTION OF THE STEADY-STATE LAMINAR HYPERSONIC BOUNDARY LAYER EQUATIONS AT THERMOCHEMICAL EQUILIBRIUM
W. Schoenauer, H. Spreuer, D. Straub, E. Adams et al Feb. 1975 96 p refs Transl. into ENGLISH of Die numerische Loesung der stationaeren laminaren Hyperschall-Igrenzschichtgleichungen unter der Voraussetzung thermochemischen Gleichgewichts, DLR-FB-73-68, DFVLR, Apr. 1973
(ESRO-TT-128; DLR-FB-73-68) Avail: NTIS HC $4.75; DFVLR, Porz, West Ger. 25.80 DM

An implicit finite difference method is presented for the numerical solution of the steady-state laminar two-dimensional hypersonic boundary layer equations at thermochemical equilibrium. The strong nonlinearity of the energy equation caused by the influence of the chemical reactions, requires the combination of the Newton iteration method and the method of finite differences. As an example the boundary layer flow past an axisymmetric hyperboloid at Mach Number 20 in air flow is computed, using a five component model for air. Multicomponent diffusion and a binary model for thermodiffusion are included. The example is computed with different parameters of the difference method in order to examine and eliminate the influence of these artificial parameters on the solution. Author (ESRO)

N75-17619# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
A MODIFIED SYSTEM FOR MASS FLOW MEASUREMENTS IN SUPERSONIC BOUNDARY LAYERS, PART 2 Final Report
Gunnar Hovstadius Aug. 1974 34 p refs
(Contract F-INK-82223-72-004)
(FFA-TN-AU-936-Pt-2) Avail: NTIS HC $3.75

The mass flow is derived from measurements of pressure derivatives in a closed volume with controlled temperature. The advantages over previous systems are mainly that fewer parameters are involved in the data reduction and that the pressure level in the system can be made arbitrarily low thereby making the risk of disattachment of the shock at the probe entrance smaller. It is therefore possible to make measurements closer to

the wall. Measurements of boundary layer properties were made with the probe at a side by side position with the combined pressure-temperature probe in the Hyp 500 wind tunnel. The mass flows measured with the new system were compared with the mass flows calculated from measurements of stagnation temperature and stagnation pressure with the probe. The results agree within the expected limit of accuracy. Author (ESRO)

N75-17620# Glasgow Univ. (Scotland). Dept. of Computing.
THE STEADY LAMINAR INCOMPRESSIBLE BOUNDARY-LAYER PROBLEM AS AN INTEGRAL EQUATION IN CROCCO VARIABLE: THE CALCULATION OF NON-SIMILAR FLOWS
R. D. Mills London Aeron. Res. Council 1974 35 p refs Supersedes ARC-34348 Sponsored by Cambridge Univ., Engl.
(ARC-R/M-3742; ARC-34348) Avail: NTIS HC $3.75; HMSO £1.45; PHI $5.80

An algorithm developed for computing the similarity flows, based on an integral equation in Crocco variables proposed for the steady laminar incompressilbe boundary layer problem in two dimensions, is extended to compute nonsimilar flows. This algorithm consists of replacing the x-derivative terms in the integral equation by finite differences so that the problem reduces to solving a nonlinear integral equation across the boundary layer at successive x-stations starting from an initial solution at x 0. To obtain convergence a double-field type of iteration with two relaxation factors is used. An analysis of the convergence of the process is given. The algorithm was found experimentally to be stable for every combination of step-sizes tried. A local matrix stability analysis of the algorithm is also carried out. A large number of examples were computed, particularly flows with discontinuous suction distributions, periodic flows and separating flows. For the standard problems the results are in agreement with the known accurate computations. Some new problems are computed. Author (ESRO)

N75-17621# Manchester Univ. (England). Dept. of Mechanical Engineering.
THE OCCURENCE AND REMOVAL OF INDETERMINACY FROM FLOW CALCULATIONS IN TURBOMACHINES
C. Bosman London Aeron. Res. Council 1974 28 p refs Supersedes ARC-34317
(ARC-R/M-3746; ARC-34317) Avail: NTIS HC $3.75; HMSO £1.10; PHI $4.30

The flow physics for inviscid flow on an arbitrary two-dimensional streamsurface for application to turbomachines were re-examined without specializing to a particular type of surface. This re-examination introduces stream function as a function of three space dimensions which is two dimensional in the locality of the prescribed stream surface and does not involve the concept of a force normal to the surface. An equation of motion was developed which is applicable to any stream surface. This equation has several advantages over the principal equations formerly used, one being that rotation of axes is no longer necessary and solutions become possible for annular ducting of increased geometrical complexity including flow around a toroidal surface as in a fluid coupling. The coordinate form of the n bar principal equation is developed for application to hub-to-shroud stream surfaces and for blade-to-blade streamsurfaces of revolution. The n bar principal form of equator gains its advantage chiefly by its freedom from indeterminacy. Other forms of indeterminacy and computational failure may arise from the choice of coordinate system used to express the derivatives and the manner in which the molecule grid points are chosen. Other failures or restrictions relate to the way in which the grid is set up. Author (ESRO)

N75-17622# Interuniversitair Reactor Instituut, Delft (Netherlands).
COMPARISON OF MASS DISTRIBUTION OF AN AEROSOL MEASURED WITH A CONGO-RED-MILLIPORE FILTER METHOD AND WITH AN AEROSOL CENTRIFUGE
P. K. G. Dastidar (Acad. Ziekenhuis, Leiden) and G. A. Ferron 1974 12 p refs
(IRI-190-74-04) Avail: NTIS HC $3.25

A comparative study was made between measuring aerosol droplet size distribution with an aerosol centrifuge designed by Stoeber, and with a Congo-red-millipore filter method (CRMF), in order to investigate the effectiveness of nebulizers used in medicine. The mean value of the mass median diameter of the unevaporated aerosols as determined by centrifuge was 3.5 or -0.3 micrometer, and the geometric standard deviation was 2.0. The mass median diameters obtained with the CRMF method was between 28 and 100 micrometers. It is concluded that the mass median diameter of an aerosol obtained with the CRMF method must be corrected for the evaporation of small particles, and the diffusion of the unevaporated particles on the filter, in an attempt to explain the large differences in the results. ESRO

N75-17623# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF GAS FLOW IN A CURVED CHANNEL
V. B. Panfilovich and V. A. Salamashkin 9 Oct. 1974 10 p Transl. into ENGLISH from Tr. Kaz. Aviats. Inst. (USSR), no. 133, 1971 p 57-61
(AD-A000131; FTD-HC-23-1484-74) Avail: NTIS CSCL 20/4

Optimum variants were investigated of curved channels which ensure minimum loss when the geometry of the flow-through portion is variable. Other topics discussed include flow velocity, separated flow, flow coefficients, aerodynamic profiles, and flow visualization. M.J.S.

N75-17624# Hydronautics, Inc., Laurel, Md.
EFFECT OF DRAG-REDUCING POLYMER INJECTION ON THE LIFT AND DRAG OF A TWO-DIMENSIONAL HYDROFOIL
D. A. Fruman, T. R. Sundaram, and S. J. Daugard Sep. 1974 38 p refs
(Contract N00014-71-C-0063; NR Proj. 062-325)
(AD-A000262; TR-7101-R) Avail: NTIS CSCL 13/10

The present paper describes an experimental investigation on the effects of injecting drag-reducing polymer solutions into the turbulent boundary layer of two NACA 63, two-dimensional, symmetrical, hydrofoils. The experiments were performed in a high-speed circulating channel with free stream velocities of up to 13 m/sec. The two foils used were 10 and 20 cm in chord, though both had a maximum thickness of 2 cm. The incidence of the foils varied between plus or minus 5 degrees with the ratios of the injection to free stream velocity of up to 0.2, and a concentration of poly(ethylene oxide), POLYOX WSR 301, of 200 ppm. The injection slits on both foils are situated one-tenth of a chord downstream of the leading edge. The gap of the injection slit was 0.0127 cm for the small foil and twice this value for the larger foil. (Modified author abstract) GRA

N75-17625# Tel-Aviv Univ. (Israel). Dept. of Mathematical Sciences.
DIFFERENCE SCHEMES WITH FOURTH ORDER ACCURACY FOR HYPERBOLIC EQUATIONS Interim Report, 1 Jun. 1973 - 14 May 1974
S. Abarbanel, D. Gottlieb, and E. Turkel Jun. 1974 54 p refs Prepared in cooperation with MIT, Cambridge
(Grant AF-AFOSR-2370-72; AF Proj. 9781)
(AD-A000394; AFOSR-74-1664TR; IR-2) Avail: NTIS CSCL 20/4

Two explicit finite difference schemes of fourth order accuracy (in space and time) are presented for the numerical solution of quasi-linear divergence free one dimensional hyperbolic systems. Both of these schemes are four step methods, one being a two level scheme, the other using three levels. These algorithms are compared in numerical examples with both second order schemes and with the DREISS-OLIGER method which is fourth order in space and second order in time. The results show that it is most advantageous to use the true fourth order schemes. Author (GRA)

N75-17626# New York Univ., N.Y. Div. of Applied Science.
STUDIES OF SEPARATED FLOWS Final Report
Roberto Vaglio-Laurin Sep. 1974 18 p refs
(Grant AF-AFOSR-2316-72; AF Proj. 9783)
(AD-A000348; AFOSR-74-1740TR) Avail: NTIS CSCL 20/4

The report describes turbulent boundary layers in strong interaction with inviscid flows around transonic airfoils. These flows can be analyzed by the procedures developed for laminar problems, provided specific families of solutions are used to describe the boundary layer profiles in different regions, such as

(a) the region upstream of the strong interaction, (b) the region between the beginning of the strong interaction and the point of reattachment, (c) the region downstream of the point of reattachment, and (d) the wake region. The main feature of the chosen solutions resides in their ability to introduce Reynolds number dependent boundary layer responses, as indicated in the available experiments. (Modified author abstract) GRA

N75-17627# Johns Hopkins Univ., Baltimore, Md.
LECTURES ON TURBULENCE AND MIXING PROCESSES IN STRATIFIED FLUIDS
Robert R. Long Oct. 1974 143 p refs
(Contract N00014-67-A-0163-0013; NR Proj. 061-198)
(AD-A000278; TR-6-Ser-C) Avail: NTIS CSCL 20/4

The report contains a set of notes based on a set of lectures for a summer course Vertical Exchange Processes in the sea. Topic 1 gives a background discussion of basic fluid mechanical problems and simple turbulence theory. Topic 2 discusses mixing in a stably stratified fluid. Topic 3 is concerned with the Richardson number, the flux Richardson number and eddy coefficients of viscosity and buoyancy together with a discussion of mass and salt transfers at the mouth of an estuary and a determination of the depth of the halocline in an estuary. Topic 4 contains a discussion of the surface layer of the atmosphere. Topic 5 discusses density currents and wake collapse. Topic 6 involves problems in which the earth's rotation is important.
Author (GRA)

N75-17628# Martin Marietta Labs., Baltimore, Md.
RADIATIVE TRANSFER OF MULTI-DIMENSIONAL FLOW GEOMETRIES Final Report, 1 Oct. 1970 - 30 Jun. 1974
S. C. Traugott Aug. 1974 74 p refs
(Contract F44620-71-C-0011; AF Proj. 9783)
(AD-A000587; MML-TR-74-27c; AFOSR-74-1602TR) Avail: NTIS CSCL 20/4

Several aspects relating to the interaction between thermal radiative heat transfer and buoyantly driven convective motions were investigated. Particular phases of the investigation were concerned with attempts at improved radiative modeling, radiative cooling of isolated buoyant thermals, boundary layers formed on horizontal surfaces by buoyancy-induced motion, convection between parallel horizontal surfaces bounding a radiating fluid, and the connection between theoretical and observed temperatures and velocities in free convection. All investigations but the first and last resulted in publications. (Modified author abstract) GRA

N75-17629# Wisconsin Univ., Madison. Mathematics Research Center.
A THEORY FOR THE FLOW OF INVISCID FLUIDS IN CHANNELS OF VARYING THICKNESS AND JETS
M. W. Johnson, Jr. Aug. 1974 23 p
(Contract DA-31-124-ARO(D)-462)
(AD-A000549; MRC-TSR-1455) Avail: NTIS CSCL 20/4

A theory for the flow of inviscid fluids in channels of varying thickness is formulated in terms of a singular integral equation. For the situation where the channel is shallow, the theory is simplified appropriately and leads to an explicit solution for the channel with given walls. For jet problems an integral equation for the free streamline is obtained. This equation is solved for the problem of a jet issuing from converging plane walls.
Author (GRA)

N75-17630# Monsanto Research Corp., St. Louis, Mo.
RHEOLOGY OF CONCENTRATED SUSPENSIONS OF SPHERES. 3. SUSPENSIONS AGGLOMERATED BY AN IMMISCIBLE SECOND LIQUID
Sheau VanKao, Lawrence E. Nielsen, and Christopher T. Hill Aug. 1974 28 p refs
(Contract N00014-67-C-0218; ARPA Order 876)
(AD-A001346; HPC-74-168) Avail: NTIS CSCL 20/4

Small amounts of a second immiscible liquid, water, were introduced into suspensions of glass beads (untreated or surface treated with dimethyldichlorosilane) in liquid polybutadiene. Water formed liquid bridges between the particles and caused the suspensions containing untreated beads to agglomerate. These large agglomerates changed the flow behavior from Newtonian to pseudoplastic. The extrapolated Bingham yield stress went through a maximum as the amount of water increased. Surfactants first decrease the pseudoplastic behavior, and then at higher concentrations, surfactants cause the suspensions to become Newtonian in behavior. A theory was developed in an attempt to explain the experimental results. The theory predicts pseudoplastic flow behavior for agglomerated suspensions, but the quantitative correlation between theory and experiment is not satisfactory. GRA

N75-17631# Southern Methodist Univ., Dallas, Tex. Thermal and Fluid Sciences Center.
LASER AND HOT-FILM ANEMOMETER MEASUREMENTS IN A SEPARATING TURBULENT BOUNDARY LAYER Final Technical Report
Roger L. Simpson, J. H. Strickland, and P. W. Barr Sep. 1974 119 p refs
(Grants DA-ARO(D)-31-124-72-G31; DAHC04-74-G-0024; ARO Proj. 10092-E)
(AD-A001115; WT-3; ARO-10092-7-E) Avail: NTIS CSCL 20/14

Measurements of a separating two-dimensional incompressible airfoil-type pressure distribution boundary layer are reported. Unique mean and fluctuation velocity measurements and the distribution of the fraction of time the flow moves downstream were obtained in the separated region using a directionally sensitive laser anemometer. Linearized hot-film anemometer measurements of mean velocities, turbulent shearing stress and intensities, eddy celerities, spectra, and dissipation were made. Wall shearing stress, bursting frequencies, wall celerity and spanwise structure were obtained using flush surface hot-film sensors. The turbulent-non-turbulent interfacial intermittency and the frequency of passage of turbulent bulges were determined using smoke as a turbulence marker and the laser anemometer system for illumination and signal detection. GRA

N75-17632# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
THE MOTION OF A SMALL SPHERICAL PARTICLE SUSPENDED IN AN OSCILLATING SHEAR FLOW
I-Dee Chang Aug. 1974 97 p refs
(Contract DAHC04-73-C-0034)
(AD-A000914; SUDAAR-487; ARO-11032.1-E) Avail: NTIS CSCL 20/4

The force on a small sphere immersed in an oscillating shear flow is investigated, based on Navier-Stokes equations by means of matched asymptotic expansions. Inertia effects introduce a lift force on the sphere directed toward the side of the flow having greater velocity. The effect of the lift on the motion of a small, neutrally buoyant sphere freely suspended in an oscillating flow of small shear rate is examined in detail. The small slip velocity between the sphere and the fluid is calculated and examined as the cause of lift. The drift velocity of a sphere of 200 micrometers in a shear flow oscillating at 1 Hz is estimated. (Modified author abstract) GRA

N75-18023 Joint Publications Research Service, Arlington, Va.
LINEAR PERFECT COMPRESSIBLE FLUID THEORY
U. K. Nigul and Yu. K. Engelbrekht *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 205-207 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 269-272 (For availability see N75-18013 09-70)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N75-17633 British Library Lending Div., Boston Spa (England).
FATIGUE CRACK GROWTH MEASUREMENTS USING THE

ELECTRICAL POTENTIAL
Ulric Betz 29 Aug. 1974 10 p ref Transl. into ENGLISH from Materialprufung (West Germany), v. 14, no. 3, 1972 p 73-77
(BLL-Dounreay-Tran-663(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Nondestructive crack detection methods are discussed including the ultrasonic, eddy current, magnetic field techniques, and the measuring microscope. The potential probe technique was also investigated and it was found that crack growth measurements can be only somewhat approximately made using the customary probe attachments due to uncontrollable oscillations in the transitional resistances. If this effect is eliminated by using solid contacts, the results improve. Author

N75-17634# National Aerospace Lab., Tokyo (Japan).
STUDY ON A DIGITALLY-TORQUE-REBALANCED ACCELEROMETER
Takao Suzuki, Masao Otsuki, and Shigeharu Enkyo 1974 26 p refs In JAPANESE; ENGLISH summary
(NAL-TR-386) Avail: NTIS HC $3.75

A digital accelerometer was developed using a delta-modulation technique. It is a combination of a floated pendulum accelerometer and a digital servo-amplifier which includes sampling, a two-level relay, and bang-bang control. The principle behind the accelerometer, its configurations, and its design are described. The stability and modes are discussed of the limit cycle when an input acceleration is relatively large. Using the dual-input function theory, it was found that the limit cycle is stable if the input acceleration is less than the maximum input, but as input acceleration becomes very close to the maximum, the limit cycle frequency approaches zero and at the same time the amplitude of the limit cycle oscillation becomes larger. This results in worse transient response and in increased static error. A precision input range of the pulse-rebalanced accelerometer, where both response time and static error are very small, is determined. Author

N75-17635*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TECHNIQUE AND COMPUTER PROGRAM FOR CALCULATING PHOTOGRAPHIC FILM DENSITY VARIATIONS
Craig W. Ohlhorst 7 Feb. 1975 32 p refs
(NASA-TM-X-72664) Avail: NTIS HC $3.75 CSCL 14E

Film density data that have been digitalized and recorded in binary coded decimal (BCD) format are converted into a number representing the film density difference between the unexposed film border and any point on a photograph by program CONVERT. The difference AVERAGE, the BCD number representing the unexposed film area and the BCD number of a specific data point is calculated and then multiplied by three constants to produce the desired film density difference. The angle off the principal axis of the lens is computed for each data point in order that a correction factor be applied to compensate for atmospheric backscattering differences and light intensity fall-off, inherent in the camera lens system in use. The program is capable of plotting the calculated density differences. The percentage of points in specific density ranges can also be computed. Author

N75-17636*# Pan American Univ., Edinburg, Tex.
A LABORATORY STUDY OF THE DIFFUSE REFLECTANCE SPECTRA OF FROSTS OCCURRING ON ASTRONOMICAL OBJECTS Final Technical Report
Frederic M. Glaser Mar. 1975 19 p
(Grant NGR-44-087-002)
(NASA-CR-136752) Avail: NTIS HC $3.25 CSCL 14B

Mechanical, optical, and operating properties of an experiment chamber are examined and possible sample contamination difficulty is explained. The mechanical and operational characteristics of this apparatus are well suited for the study of the reflectance spectra of frosts. The infrared energy available at the detector is low and steps to increase the energy and the responsivity of the detector were taken. The problem of a standard diffuse reflector which is useful in the far ultraviolet region is considered and it is suggested that bright gold be used as the standard. Author

N75-17637*# Lowell Observatory, Flagstaff, Ariz. Planetary Research Center.
SYNOPTIC PLANETARY IMAGING WITH THE LST HIGH-RESOLUTION CAMERA
W. A. Baum 1974 23 p refs Submitted for publication
(Grant NGR-03-003-007)
(NASA-CR-136763) Avail: NTIS HC $3.25 CSCL 14E

The value of synoptic imaging of the planets is illustrated. Advantages of the large space telescope, as compared with ground based telescopes, planetary orbiters, and flybys are discussed. Desirable LST camera parameters and observing strategies are considered from the standpoint of synoptic imaging. Author

N75-17638*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
TEST EVALUATION OF POTENTIAL HEATSHIELD CONTAMINATION OF AN OUTER PLANET PROBE'S GAS SAMPLING SYSTEM
W. C. Kessler Washington NASA Jan. 1975 99 p refs
(Contract NAS2-8218)
(NASA-CR-137619) Avail: NTIS HC $4.75 CSCL 14B

The feasibility of retaining the heat shield for outer planet probes was investigated as a potential source of atmospheric sample contamination by outgassing. The onboard instruments which are affected by the concept are the pressure sensor, temperature sensor, IR detector, nephelometer, and gas sampling instruments. It was found that: (1) The retention of the charred heatshield and the baseline atmospheric sampling concepts are compatible with obtaining noncontaminated atmospheric samples. (2) Increasing the sampling tube length so that it extends beyond the viscous boundary layer eliminates contamination of the atmospheric sample. (3) The potential for contamination increases with angle of attack. F.O.S.

N75-17639*# Beta Industries, Inc., Dayton, Ohio.
AN ELECTRONIC SYSTEM FOR MEASURING THERMOPHYSICAL PROPERTIES OF WIND TUNNEL MODELS Final Report
Richard R. Corwin and Joseph S. Kramer Washington NASA Mar. 1975 78 p refs
(Contract NAS1-12127)
(NASA-CR-2511) Avail: NTIS HC $4.75 CSCL 14B

An electronic system is described which measures the surface temperature of a small portion of the surface of the model or sample at high speeds using an infrared radiometer. This data is processed along with heating rate data from the reference heat gauge in a small computer and prints out the desired thermophysical properties, time, surface temperature, and reference heat rate. This system allows fast and accurate property measurements over thirty temperature increments. The technique, the details of the apparatus, the procedure for making these measurements, and the results of some preliminary tests are presented. Author

N75-17640# Sandia Labs., Albuquerque, N.Mex.
DIELECTRIC STRENGTH OF X-CUT QUARTZ AFTER THERMALLY INDUCED STRESS CYCLING: APPLICATION TO UNDERSTANDING THE SANDIA QUARTZ GAUGE
C. H. Seager Aug. 1974 12 p refs
(Contract AT(29-1)-789)
(SAND-74-0135) Avail: NTIS HC $3.25

The possible origins of the so-called -X anomaly in the Sandia Quartz gage are discussed. Recently, experiments were performed to determine the dielectric strength of SiO_2 under conditions simulating some aspects of gage operation. These data as well as the work of Korzo suggest that quartz that has been severely thermally or mechanically strained may break down at electric fields considerably below those characterizing unstrained single crystal quartz. It is concluded that these facts enhance the possibility that the -X anomaly is a breakdown phenomenon depsite the low fields characterizing its occurrence.
Author (NSA)

N75-17641# Hawker Siddeley Dynamics Ltd., Hatfield (England). Space Div.
STUDY OF TECHNOLOGICAL REQUIREMENTS ASSOCIATED WITH INTERFEROMETRIC INFRARED (IR) ASTRONOMY
J. B. Farrow, comp. Sep. 1974 293 p refs Sponsored in part by Natl. Phys. Lab. and Edinburgh Instr.

(Contract ESRO-2039/73-PP)
(HSD-TP-7491; ESRO-CR(P)-538) Avail: NTIS HC $8.75

Mission objectives and payload concepts were analyzed for shuttleborne infrared interferometer providing high spatial resolution. Suitable components and subsystems are specified. The IR interferometer will be used to investigate the nuclei of galaxies, the dense region of our galaxy, some circumstellar clouds, and extragalactic objects where one observes high concentration of dust and complex molecules. The wavelength range considered has a lower limit of 10 micrometer and an upper limit of 500 micrometer. As a result of comparative studies of alternative interferometer configurations, it was concluded that a triple heterodyne interferometer is the preferred solution at the lower end of the wavelength range considered, whereas for longer wavelengths a less complex two-element heterodyne interferometer would be preferred. ESRO

N75-17642# Institut Franco-Allemand de Recherches, St. Louis (France).
FLAME TEMPERATURE MEASUREMENTS USING LINE INVERSION METHOD WITH DIRECT READING [TEMPERATURMESSUNGEN AN FLAMMEN NACH DER LINIENUMKEHRMETHODE MIT EINFACHER ABLESUNG]
H. Mach and U. Werner 15 Feb. 1974 40 p refs In GERMAN
(ISL-6/74) Avail: NTIS HC $3.75

A line inversion method via the Na-resonance line is discussed, which can be used for routine temperature measurements of gas or kerosene flames in the range 1700 to 2200 K. The inversion takes place by periodic attenuation of the reference lamp radiations using a polarizer-analyzer system. By inserting a quarter wavelength plate the transmission range can be reduced and the accuracy proportionally increased. An X-Y plotter is used for recording purposes. The method was used to measure the temperature distribution along the axis of a natural gas/air flame. ESRO

N75-17643# Stanford Research Inst., Menlo Park, Calif.
RECTANGULAR COAXIAL SKIN TESTER Final Report, 10 May - 30 Oct. 1974
E. Vance and W. C. Wadsworth Sep. 1974 37 p refs
(Contract F29601-69-C-0127; AF Proj. 3763; SRI Proj. 7995)
(AD-786884; AFWL-TR-74-157) Avail: NTIS CSCL 14/2

The report describes a testing device for measuring the electromagnetic leakage through joints or access hatches in aircraft and missile skin samples. Operating instructions for the tester are provided, and the results of calibration tests with it are given. The tester operates on the principle of iris-coupled coaxial transmission lines. The test sample containing the leaky joint or access door is made into a common wall shared by two rectangular coaxial transmission lines. Author (GRA)

N75-17644# Army Foreign Science and Technology Center, Charlottesville, Va.
METHODS OF CLARIFYING HARDLY DISCERNIBLE DETAILS ON PHOTOGRAPHIC IMAGES
M. Ya. Lebedeva 29 Jan. 1974 11 p Transl. into ENGLISH from Mosk. Inst. Inzh. Geod. Aerofotoseski i Kartografii, Tr. (USSR), v. 55, 1967 p 59-69
(AD-A000221; FSTC-HT-23-1751-73) Avail: NTIS CSCL 14/5

Clarification of photographing details by various methods is discussed. Light filters, specialized papers, spectral analysis, ultraviolet beams, pigmentation in filter equipment are given in detail. GRA

N75-17645# Army Foreign Science and Technology Center, Charlottesville, Va.
THE SGN-27D SYSTEM FOR HYDROSTATIC LEVELING
I. V. Lavrentev, R. A. Movsesyan, and E. A. Khesed 6 Feb. 1974 14 p refs Transl. into ENGLISH from Geod. Kartografiya (USSR), no. 11, 1972 p 23-28
(AD-A000213; FSTC-HT-23-1605-73) Avail: NTIS CSCL 13/2

The SGN-27D system of hydrostatic leveling is explained in detail. The instruments differ from those used in ordinary leveling and provide greater accuracy. Testing was done in the field, good results were obtained, and it is hoped that the system will be used more widely in the future. GRA

N75-17646# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE METHODS OF OSCILLOGRAPHIC MEASURE OF PARAMETERS OF SIGNALS AND THE TASK OF AUTOMATIZATION OF CONTROL
S. M. Nadikov 15 Oct. 1974 17 p Transl. into ENGLISH from Vychisl. Tekhn. Mashinostr. (USSR), Dec. 1970 p 128-134
(AD-A000140; FTD-HC-23-2883-74) Avail: NTIS CSCL 14/2

An analysis of the existing methods of oscillographic measuring of the parameters of signals, the basis of the necessity of the transfer from the analogic form of expressing the signal to the discrete form, and the choice of the method of discretion is given. GRA

N75-17647# Michigan Dept. of State Highways. Research Lab. Section.
APPLICATION OF INSTRUMENTAL METHODS FOR EVALUATING HIGHWAY MATERIALS (INFRARED SPECTROSCOPIC CHARACTERIZATION OF PAVING ASPHALTS IN RELATION TO DURABILITY) Final Report
W. L. Frederick Jun. 1974 70 p refs
(PB-236653/2; R-751) Avail: NTIS HC $4.25 CSCL 13C

This report presents information obtained during a study aimed at finding correlations between durability of paving asphalts and differences in composition of the asphalts as shown by infrared spectrophotometric data. Six asphalts used in an experimental test road (1954) and ten asphalts representative of those available in Michigan in 1965, were characterized by infrared spectroscopy. The infrared data were correlated with: pavement performance (test road asphalts only), weatherometer exposure (1965 asphalts only), a pellet tumbling test to gage durability as aggregate binders, and the crude oil sources of the asphalts. The general agreement of the infrared data, with the results of the above tests, indicates that infrared spectroscopic methods can be used to help predict the potential durability of an asphalt in pavement. Moreover, it is often possible to identify the crude oil source of an unknown asphalt, provided that infrared reference data are available for asphalts from the same crude oil source. GRA

N75-17648# Naval Postgraduate School, Monterey, Calif.
ELECTROGASDYNAMIC SPECTRAL ANEMOMETER
Oscar Biblarz 1 Nov. 1974 45 p refs
(AD-A001262; NPA-57ZI74112) Avail: NTIS CSCL 14/2

The electrogasdynamic (EGD) anemometer consists of an injector of unipolar charged particles fed into the flow to be probed, an equilibration region, and a collector for the charges. The particles are many times heavier than the molecules in the gas and they interact with the flow through drag forces. If these particles are tightly coupled to the flow, then the collecting probe receives information in electrical form about the fluid velocity. Besides being a direct velocity measurement, the probe can be of streamlined shape and very rugged, and it is insensitive to temperature differences in the flow. The charged particles can be chosen so as to give the desired range of frequency response. The instrument is sensitive to impurities in the flow but in principle the effect may be calibrated out. GRA

N75-17649# Army Foreign Science and Technology Center, Charlottesville, Va.
ON THE STABILITY OF MODULATION TRANSFER FUNCTIONS OF PHOTOGRAPHIC FILMS UNDER VARIOUS PROCESSING CONDITIONS
V. Ya. Mikhailov 6 Mar. 1974 7 p refs Transl. into ENGLISH from Intern. Congr. of Phot. Sci., Moscow, Jul. 1970 p 187-190
(AD-A001206; FSTC-HT-23-1475-73) Avail: NTIS CSCL 14/5

The manner in which different conditions of development influence the values of modulation transfer functions (MTF)s obtained has been examined; the effect on contrast, average projection area of the grains, relative sensitivity and resolving power have been considered, and some experimental results are tabulated. GRA

N75-17650# Frankford Arsenal, Philadelphia, Pa.
APPLICATION OF INSTRUMENT MONITORING AND CONTROL DEVICES FOR THE PRECISION ALIGNMENT OF GLASS PRISMS TO METAL
Joseph Mooney Aug. 1974 16 p
(DA Proj. 6737269)
(AD-A001554; FA-TR-74013) Avail: NTIS CSCL 14/2

The report describes a study that was undertaken to determine the type and number of deficiencies encountered in the inspection of adhesive bonded prism assemblies using glass-to-metal bonding procedures. This report also describes the approach employed to correct the deficiencies highlighted by the bonding study. The approach is primarily concerned with maintaining the precision alignment that is required between the glass prism, the metal adherend, and the bonding fixture. The fixture locates and holds the glass and metal components throughout the entire bonding cycle. GRA

N75-17651# Air Force Weapons Lab., Kirtland AFB, N.Mex.
A GRAZING INCIDENCE SPECTROGRAPH AS APPLIED TO VACUUM ULTRAVIOLET, SOFT X-RAY, PULSED PLASMA SOURCES Final Report, May - Dec. 1973
Erskine J. T. Burns Jul. 1974 45 p refs
(AF Proj. 8809)
(AD-A000044; AFWL-TR-74-121) Avail: NTIS CSCL 14/2

A 2.2-meter variable angle of incidence grazing incidence spectrograph is described for photographic recording of spectra down to 10A. Also a method for determining the absolute total fluence from a pulsed plasma source, knowing the absolute sensitivity of the instrument, is described. Spectra are presented from a low-inductance sliding spark gap and a 20-kj dense plasma focus. A program for spectrum analysis is included. (Modified author abstract) GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N75-17652# Bureau of Radiological Health, Rockville, Md.
A LIMITED SURVEY OF HEALTH-RELATED LASER CHARACTERISTICS FOR SELECTED APPLICATIONS IN THE UNITED STATES
W. R. Payne and R. W. Peterson Jan. 1974 56 p
(DHEW(FDA)-74-8016) Avail: SOD HC $0.95

Performance characteristics and use conditions of laser products are studied at selected operational sites in high schools, colleges, universities, and industrial construction areas in seven States. This study was performed in order to gather engineering data in support of the development of a safety performance standard for laser products. Data obtained for the 288 lasers found at 108 facilities indicated serious shortcomings in laser safety within the United States. Author

N75-17653# National Weather Service, Sterling, Va. Test and Evaluation Lab.
EVALUATION OF A SPERRY LIDAR CEILOMETER Final Report, Apr. 1973 - Mar. 1974
David H. George Feb. 1974 43 p refs
(Contract DOT-FAA-ER-450-006)
(AD-777820; FAA-RD-74-23) Avail: NTIS HC $3.25

An evaluation of a Sperry Lidar Ceilometer was made relative to the Rotating Beam Ceilometer (RBC). The lidar ceilometer is described. Digital and analog cloud height data from the lidar ceilometer and analog cloud height data from the RBC were recorded and analyzed. Comparison of lidar and RBC cloud height measurements showed that RBC tends toward greater cloud height and the lidar tends toward lower cloud height. The lidar is shown to be an improvement over the RBC in terms of installation, maintenance, and operation. Author

N75-17654*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PASSIVELY COOLED GLASS CO2 LASER TUBES FOR SEVERE ENVIRONMENTS
Harold E. Walker and Edward H. Johnson Dec. 1974 25 p
(NASA-TM-X-70824; X-720-74-354) Avail: NTIS HC $3.25 CSCL 20E

The objective of this effort was to design a glass CO2 laser tube that could survive the Titan 3 C launch environment and at the same time provide adequate thermal conductivity to maintain the wall of the laser tube below approximately equal to 50 C for efficient lasing. The approach that was taken to satisfy these requirements was to pot the tube in an aluminum heat sink using a space qualified polyurethane potting material. Two configurations of the laser tube successfully passed the complete Titan 3 C qualification level sine and random vibration specification and satisfied the thermal requirements. Fabrication details and test results are presented that indicate this could be a practical solution for laser tubes used in a severe environment and where flowing coolants are impractical or undesirable. Author

N75-17655# Maryland Univ., College Park. Center for Theoretical Physics.
ELECTRON-LASER PULSE SCATTERING
Milton D. Slaughter Jan. 1975 30 p refs
(TR-75-051) Avail: NTIS HC $3.75

A formulism is reported for calculating the scattering amplitudes of electron-laser pulse processes. The results make use of standard Feynman-Dyson S-matrix techniques and the LSZ reduction formalism. The laser pulse is described quantum-mechanically as a coherent state wave packet, while the electron is represented by wave-packet solutions of the Dirac equation in the case of scattering boundary conditions, or by Volkov wave packets when non-scattering boundary conditions are used. The existence of new, nonlinear corrections of a quantum-mechanical nature for the process of stimulated Compton scattering was demonstrated. Author

N75-17656# Advisory Group for Aerospace Research and Development, Paris (France).
EVALUATION OF THE POTENTIAL BENEFIT TO THE AERONAUTICAL FIELD FROM LASER TECHNOLOGY [EVALUATION DES APPLICATIONS POTENTIELLES DU LASER DANS LE DOMAINE AEROSPATIAL]
J. Bertrais (STTA, Paris) Dec. 1974 8 p In FRENCH
(AGARD-AR-65) Avail: NTIS HC $3.25

A resume on lasers and their application to aerospace are presented. Data cover: trajectography - tracking, characteristic properties of lasers, laser telemetry, holographic storage of optical images, and optical fiber communication. Transl. by E.H.W.

N75-17657*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
LASER PULSE ANALYSIS
C. G. Lehr, C. R. H. Tsiang, G. M. Mendes, and R. J. Eldred May 1973 14 p ref Presented at 1st Intern. Symp. on Use of Artificial Satellites for Geodesy and Geodyn., Athens, 14-21 May 1973
(Grant NGR-09-015-196)
(NASA-CR-136759; SAO-305-037) Avail: NTIS HC $3.25 CSCL 20E

Methods are presented for locating threshold points by using laser pulse analysis. It was found that there are errors involved in the determination of each of these quantities, and an attempt was made to separate their effects on the overall range correction. Several series of corrected range measurements for fixed reflectors and satellites were obtained. Residuals were computed by fitting the range measurements to either fixed-reflector distances or short arcs of satellite orbits. Root mean square values of these residuals are presented. Author

N75-17658# Los Alamos Scientific Lab., N.Mex.
MODEL FOR THE CW POWER OUTPUT OF THE HF CHEMICAL LASER
R. C. Mjolsness Jul. 1974 12 p refs Sponsored in part by AFWL
(Contract W-7405-eng-36)
(LA-5683-MS) Avail: NTIS HC $3.25

A radiation model is presented for inclusion in hydrodynamics codes calculating steady state chemical lasing conditions. The model assumes that if sufficient gain exists for lasing to occur, then P-branch lasing occurs for 3 yields 2, 2 yields 1 and 1 yields 0 transitions at the (local) J value corresponding to maximum

zero power gain. For simplicity, all HF states with v > 3 are ignored. The theory yields the local and total power output, the local specific intensity of the radiation field and the local distribution of the HF population among the vibrational states. Very crude predictions could be obtained for the spectral distribution of the emitted radiation, although the theory is not well suited to that purpose. Author (NSA)

N75-17659# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STUDY OF THE AMPLIFICATION OF LIGHT IN A PULSED GAS-DYNAMIC LASER WITH THE COMBUSTION OF ACETYLENE-AIR MIXTURES

G. I. Kozlov, V. N. Ivanov, and A. S. Korablev 22 Oct. 1974 17 p refs Transl. into ENGLISH from Zh. Eksperim. Teor. Fiz. (Moscow), v. 65, no. 1, 1973 p 82-87

(AD-A000357; FTD-MT-24-1497-74) Avail: NTIS CSCL 20/5

Values are measured of the amplification factors of the products of combustion of acetylene-air mixtures during expansion in a hypersonic nozzle depending on the stagnation parameters and concentration of acetylene in the initial mixture. It is shown that during shock wave propagation in a gas with inverse population density first an increase in the amplification occurs, and then a rapid transition from amplification to absorption. GRA

N75-17660# Arizona Univ., Tucson. Optical Sciences Center.

INVESTIGATION OF GENERATION AND PROPAGATION OF INTENSE RADIATION Final Report, Mar. 1973 - Mar. 1974

F. A. Hope, D. N. Ragovin, M. Sargent, III, M. O. Sully, and H. Shih Aug. 1974 41 p refs

(Contract F29601-73-C-0056; AF Proj. 3326)

(AD-A000038; AFML-TR-74-68) Avail: NTIS CSCL 20/5

The described research provided fundamental theoretical support of the high-energy laser program, particularly with regard to concepts germane to that program several years hence. The work has centered in four major areas: propagation of intense radiation, laser theory, amplifier theory and molecular physics (particularly of the water molecule). This report summarizes the work completed under the contract and provides references to more detailed accounts of that work published elsewhere. Included are abstracts of papers published (or to be published) elsewhere. Among the highlights of the collected final report are a strikingly successful, yet simple, model of the H2O molecule; a very promising scheme for a soft X-ray laser; further advances in the multimode unstable resonator theory; and justification of the rate equation approach to treating lasers with cascade transitions. GRA

N75-17661# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

SATELLITE MOUNTED TRACKING OPTICS TO CONTINUOUSLY PUMP SUN-PUMPED LASER Final Report, 2 Jan. - 6 Mar. 1974

Dennis L. Boesen, Erik S. Buck, Walter F. Caldwell, Charles H. Coolidge, Jr., and David R. Durham Jul. 1974 32 p refs

(AD-A000040; AFAL-TR-74-97) Avail: NTIS CSCL 20/5

The results of a design investigation into the optical system required to continually sun pump a satellite borne laser are presented. The design criteria were that the system be comprised of only spherical optics, be made as compact as possible, and correct for a 1/2 degree satellite tracking error. One design is presented which meets all design criteria. Another design investigates the possibilities of replacing all optical components with a Fresnel lens. Although this system could not simultaneously deliver the required power and correct for the 1/2 degrees tracking error, the necessary trade-offs needed for the simple lens system to work are presented. Author (GRA)

N75-17662# Army Foreign Science and Technology Center, Charlottesville, Va.

GENERATION SPECTRA OF RUBY LASER WITH FREQUENCY SCANNING

Yu. Yu. Zhupan, V. V. Zaika, and V. I. Kravchenko 26 Mar. 1974 12 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (USSR), v. 17, no. 11, Nov. 1972 p 1803-1808

(AD-A000219; FSTC-HT-23-1745-73) Avail: NTIS CSCL 20/5

Generation spectra and kinetics of frequency scanning ruby laser were investigated over a wide range of scanning velocities. It is shown that, at high velocities, generation is essentially determined by the properties of the cavity with phase aberration. GRA

N75-17663# Army Foreign Science and Technology Center, Charlottesville, Va.

EXPERIMENTAL INVESTIGATION INTO A METHOD OF DETECTING SHF MODULATED LASER RADIATION BY A PHOTOCELL

R. A. Movsesyan, V. A. Papyan, and K. B. Gyunashyan 26 Jun. 1974 9 p refs Transl. into ENGLISH from Geod. Kartografiya (USSR), no. 2, Feb. 1973 p 39-43

(AD-A000230; FSTC-HT-23-152-74) Avail: NTIS CSCL 20/5

A device is described in which a SHF-modulated laser beam is modulated using a lithium niobate crystal and demodulated by use of a photoelectric multiplier photocathode. The modulator and demodulator are located in the same coaxial cavity resonator, in externally applied electrical and magnetic fields; the light beam passing through the modulator is reflected from a reflector mounted on a micrometer scale and a mirror to the photocathode. The phase difference between the signal received and the reference signal (the electrical field) is measured with a high degree of accuracy at the light flux minima registered on an oscillograph. Advantages and disadvantages of this method, compared with those of demodulation in a device identical to the modulator are discussed. GRA

N75-17664# Air Force Weapons Lab., Kirtland AFB, N.Mex.

COLD CATHODE ELECTRON BEAM CONTROLLED CO2 LASER PERFORMANCE Final Report, 6 Jul. 1972 - 5 Dec. 1973

Leslie L. McKee, III, Steven R. Patterson, Richard A. Lindstrand, and Richard P. Kinkade Oct. 1974 28 p refs

(AF Proj. 8809)

(AD-A000418; AFWL-TR-74-163) Avail: NTIS CSCL 20/5

A cold cathode electron beam controlled CO2 laser has been constructed. The laser has produced up to 50 joules of output energy and peak powers as high as 1 GW. Various laser system parameters which control the laser output have been investigated. The laser performance has been compared with theoretical studies. Author (GRA)

N75-17665# Atlantic Research Corp., Alexandria, Va.

COPPER VAPOR GENERATOR Final Report, 31 May 1972 - 31 May 1973

Robert B. Keller, Sandor Holly, William T. Walter, Nicholas Solimene, and James T. LaTourrette Sep. 1974 116 p refs Prepared in cooperation with Polytechnic Inst. of New York, Brooklyn

(Contract F29601-72-C-0080; ARPA Order 870)

(AD-A000555; AFWL-TR-73-223) Avail: NTIS HC$5.25 CSCL 20/5

Solid fuel propellants seeded with copper powder have been examined as an example of chemical generation of the copper vapor in a copper-vapor laser that has the potential of generating a visible output (510.6 nm) with high efficiency. Chemical generation of the copper vapor is the only approach capable of producing an overall electrical efficiency of 10 percent in a flowing copper-vapor laser. The effect of Ar, N2, CO2, CO, H2, and H2O as additive gases on the laser's performance has been determined. A simulated propellant-generated copper-vapor laser was demonstrated by flowing the expected mixture of tank gases over molten copper upstream of the laser cavity. Laser performance was seriously degraded due to the presence of the additive gas mixture. The propellant-generated tests were unsuccessful in part due to insufficient vaporization of the copper seed particles which were distributed in the solid fuel propellant. A heat-pipe copper-vapor laser was also demonstrated. Author (GRA)

N75-17666# Radio Corp. of America, Princeton, N.J.

In(X)Ga(1-X)As 1.06 MICROMETER INJECTION LASERS Final Report, 15 Mar. 1973 - 14 Mar. 1974

C. J. Nuese and M. Ettenberg Aug. 1974 71 p refs

(Contract F33615-73-C-1177)

(AD-A000382; PRRL-74-CR-26; AFAL-TR-74-144) Avail: NTIS CSCL 20/5

Electroluminescent junctions of InxGal-xAs for 1.06-micron laser diode evaluation were prepared by vapor-phase and liquid-phase epitaxial growth techniques. From the vapor-grown structures, laser diodes with threshold current densities as low as 1000 A/sq cm and external differential quantum efficiencies as high as 50% at 77 K were obtained. This material also has yielded devices which have been operated cw (at 77 K) for the first time with the emission of 64 mW of coherent 1.06-micron. The operating life of the InxGal-xAs p-n junctions was found to be significantly higher than that of comparably prepared GaAs junctions. The improved resistance to gradual degradation with increasing InAs content is tentatively attributed to reduced junction emission energy and to the existence of a phonon-kick degradation model. Author

N75-17667# Informatics, Inc., Rockville, Md.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NO. 16, APRIL - JUNE 1974 Scientific Interim Report
Stuart G. Hibben 1 Nov. 1974 131 p refs
(Contract N00600-75-C-0018)
(AD-A000270) Avail: NTIS CSCL 20/5

This is the Soviet Laser Bibliography for the second quarter of 1974 and is No. 16 in the series on Soviet laser developments. The coverage includes basic research on solid state, liquid, gas, and chemical lasers; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; crystal growing; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; computer technology; holography; laser-induced chemical reactions; instrumentation and measurements; beam-target interaction; and plasma generation and diagnostics. GRA

N75-17668# Rocketdyne, Canoga Park, Calif.
FEASIBILITY OF NEW LASERS Final Report, 15 Apr. - 26 Sep. 1974
Lawrence H. Hall 8 Nov. 1974 63 p refs
(Contract DAAH01-74-C-0586)
(AD-A000892; R-9597; RK-CR-75-16) Avail: NTIS CSCL 07/4

The objective of the study was to investigate selected alkali-metal halogen reactions to evaluate their potential for new chemical lasers at suitable wavelengths. The chemiluminescence of the alkali-metal atoms was spectroscopically observed and was analyzed to measure population inversions in the excited electronic states of the alkali-metal atoms as a function of reaction conditions. The conditions included nozzle configuration, reactant ratios, and reactant pressures for the Cs/F2 reaction system. Spatial scans were performed, and gains were calculated for all observed population inversions. Absorption and extinction experiments were also performed. The results of this study have established the reaction conditions for the Cs/F2 system most likely to give lasing. GRA

N75-17669# Informatics, Inc., Rockville, Md.
EFFECTS OF HIGH POWER LASERS, NO. 4
Stuart G. Hibben, John Kourilo, and B. L. Shresta 31 Oct. 1974 64 p refs
(Contract N00600-75-C-0018; DARPA Order 2790)
(AD-A001109) Avail: NTIS CSCL 20/5

This is the fourth compilation of abstracts of Soviet studies on high power laser technology, covering material published from April through September 1974. Articles are grouped by laser interaction with metals, dielectrics, semiconductors, miscellaneous targets, and laser-plasma interaction. GRA

N75-17670# Wyoming Univ., Laramie. Dept. of Mechanical Engineering.
A LASER SYSTEM FOR DETERMINATION OF ROCKET ATTITUDE AND ROLL RATE Technical Report, 15 Nov. 1973 - 14 Jul. 1974
Kynric M. Pell, Mark J. Russell, John E. Nydahl, and William R. Russell Jul. 1974 96 p refs
(Contract DAHC04-74-G-0063)
(AD-A001235; UWME-DR-4061051; ARO-12102.2-RTL) Avail: NTIS CSCL 17/8

The use of ground based tracking laser transmitting and detecting stations and retroreflector equipped vehicles as a system to determine vehicle attitude and roll rate is investigated. Ground station location and vehicle dynamics are considered. The results show that the system represents a viable approach to test range instrumentation. GRA

N75-17671# Hughes Research Labs., Malibu, Calif.
REACTIVE ATMOSPHERE GROWTH OF 2.06 MICRON LASER CRYSTALS Final Technical Report, 11 Sep. 1973 - 8 Jun. 1974
D. P. Devor, R. C. Pastor, M. Robinson, W. M. Akutagawa, and K. Arita Oct. 1974 98 p refs
(Contract DAAB07-74-C-0034; DA Proj. 1S7-62703-DH-93)
(AD-A001557; ECOM-74-0034-F) Avail: NTIS CSCL 20/5

A specified formula Y(0.428)Er(0.500)Tm(0.067)Ho(0.005) LiF4 was used as a first approximation to a laser system whereby the necessary broad pump bands and fast, efficient laser excitation could be obtained. Laser rods were cut from single crystal ingots grown by a reactive atmosphere process (RAP). Thermal conductivity, hardness, elastic modulus, rupture strength, radiative characteristics, and laser test data were measured to determine the laser performance characteristics of Ho:YLF. Development of RAP Ho:YLF growth procedures provided proof of practical, congruent melting behavior. Electron probe, spectrographic analysis, and backscatter measurements showed R(3+) (R + Y + Er + Tm + Ho in Ho:YLF) acted as one ionic species in crystal growth. Glass-like optical quality Ho:YLF was RAP Czochralski grown at 5 mm/hour. A short investigation of Bridgman growth indicated that higher yields and inexpensively scaled-up rod production technology can be developed. GRA

N75-17672# University of Southern Calif., Los Angeles. Center for Laser Studies.
EVALUATION OF Nd:YVD4 AND Ho:Er:Tm:YVO4 AS PULSE PUMPED Q-SWITCHED LASERS Semiannual Technical Report, 1 Jan. - 1 Jul. 1974
Michael Bass, Larry G. Deshazer, and Uri. Ranon Jul. 1974 61 p refs
(Contract DAAB07-74-C-0104; DA Proj. 1S7-62703-A-186)
(AD-A000911; ECOM-74-0104-1) Avail: NTIS CSCL 20/5

Yttrium orthovanadate (YVO4) doped with rare earth ions was investigated for use as a pulse pumped Q-switched laser material. Two laser ions were studied in detail: neodymium (Nd(3+)) and holmium (Ho(3+)) sensitized with erbium and thulium. Measurements of the optical absorption and emission spectra, energy levels and stimulated emission cross-sections are reported. Crystal growth and laser performance are discussed. GRA

N75-17673# ILC Technology, Inc., Sunnyvale, Calif.
PRODUCTION ENGINEERING MEASURE FOR OPTICAL PUMPS FOR LASERS Quarterly Report, Apr. - Jun. 1974
Robert Maynard Aug. 1974 38 p refs
(Contract DAAB05-73-C-2078)
(AD-A000903; R-ILC-73-22/Q4; QR-4) Avail: NTIS CSCL 20/5

The program is directed towards establishing a capability for manufacturing flashlamps that are to be used as optical pumps for laser systems. Optical Pump 1 is designed for liquid-cooled operation and Optical Pump 2 is designed for cooling by compressed nitrogen gas. The program consists of design, fabrication and testing. GRA

N75-17674# Stanford Univ., Calif. Microwave Lab.
A STUDY OF OPTICAL EXCITATION BY HIGHLY MONOCHROMATIC TUNABLE DYE LASERS Final Report, 24 Apr. 1971 - 23 Apr. 1974
Arthur L. Schawlow Sep. 1974 9 p refs
(Contract DAHC04-71-C-0030)
(AD-A000898; SU-ML-2359; ARO-9729.5-P) Avail: NTIS CSCL 07/4

Several aspects of optical excitation by highly monochromatic tunable dye lasers have been investigated, including the development of a narrowband repetitively pulsed dye laser system, the study of Na2 molecules by high resolution saturation spectroscopy, the detection of weak absorption spectra by intracavity quenching of broadband dye laser oscillations, the observation of line broadening by optical nutation in pulsed laser saturation spectroscopy, and the study of two-photon absorption of highly excited Cs states. GRA

N75-17675# Owens Valley Radio Observatory, Pasadena, Calif.
RADIATIVE TRAPPING AND POPULATION INVERSIONS OF THE SiO MASERS
Nick Scoville and John Kwan 1974 19 p refs Prepared in cooperation with Princeton Univ.
(Contracts N00014-67-A-0094-0019; Grants NSF GP-30400; NSF GP-40768)
(AD-A001067; Rept-1974-12) Avail: NTIS CSCL 07/4

Radiative trapping in the v = 0 to 1 vibrational transitions decreases the rate of de-excitation of a v = 1 level as its rotational quantum number increases. This effect readily leads to population inversions of the v = 1 rotational transitions if population is transferred from v = 0 into v = 1 by collisions or by an indirect radiative route, as, for example, through absorptions from v = 0 into v = 2 and the subsequent spontaneous cascade from v = 2 to v = 1. Numerical calculations which model the SiO masers discovered towards stars give photon emission rates in the J = 1 to 0, J = 2 to 1, and J = 3 to 2 transitions which are comparable and substantially approximately 3 x 10 to the 43d power/s. Author

N75-17676# Mathematical Sciences Northwest, Inc., Seattle, Wash.
MOLECULAR LASERS IN E-BEAM STABILIZED DISCHARGED Semiannual Report, 15 May - 15 Nov. 1973
S. R. Byron, L. Y. Nelson, C. H. Fisher, G. J. Mullaney, and A. L. Pindroh Aug. 1974 67 p refs
(Contract N00014-72-C-0430; NR Proj. 016-408)
(AD-A001062; MSNW-74-105-3; SAR-3) Avail: NTIS CSCL 20/5

The reported program is directed toward developing efficient, high energy density electric discharge lasers in the infrared and visible regions of the spectrum. A high current, electron-beam-stabilized, electric discharge is used for excitation. Infrared laser emission and absorption from the vibrational levels of HF (2.8 to 3.1 micrometers) and DF (3.8 to 4.1 micrometers) in various gas mixtures is being studied to determine laser efficiency and to obtain a detailed model of the vibrational kinetics. The efficiency of electric discharge excitation of molecular vibration in these gases is being determined by solving the electron Boltzmann equation. Electronic state excitation by e-beam stabilized electric discharges in N2 and other molecular systems is being investigated in an effort to develop efficient, long pulse visible lasers. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N75-17677 British Library Lending Div., Boston Spa (England).
VIBRATION AND STRAIN MEASUREMENT ON TURBO-GENERATORS
G. Peters Feb. 1974 32 p refs Transl. into ENGLISH from VGB Kraftwerkstechn. (Germany), v. 53, no. 4, Apr. 1973 p 224-244
(BLL-CE-Trans-6330-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

Monitoring transducers are positioned along the turbine shaft to check: (1) thermal expansion of the revolving parts; (2) operation for warming up; (3) run-up including detection of resonance magnification during resonance passages in the critical speed range; (4) load and continuous operation for monitoring changes in running quality; and (5) run-down including resonance magnification. An inductive capacitance measuring method is reported that uses the eddy current method to monitor shaft vibrations. G.G.

N75-17678 British Library Lending Div., Boston Spa (England).
THE EXPLOSIVE COMPACTION OF CERAMIC AND METAL POWDERS AND THEIR MIXTURES
R. Pruemmer 29 Oct. 1973 25 p refs Transl. into ENGLISH from Ber. Deut. Keram. Ges. (Rhein), v. 50, no. 3, 1973 p 75-81 Presented at the Ann. Meeting of the Ger. Ceram. Soc., Goslar, West Ger., 4 Oct. 1972
(BLL-Risley-TR-2691-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The choice of suitable explosive and its amount are of decisive importance for the quality of explosively produced pressings. Example compactions of various metal and ceramic powders in cylindrical samples produced optimum results when their measured densities are plotted as a function of the square of the detonation velocity. A maximum density of 97% of the theoretical density for a tungsten sample pressing is reported. G.G.

N75-17679 British Library Lending Div., Boston Spa (England).
DESIGN AND OPERATIONAL BEHAVIOUR OF LONG END-STAGE BLADES IN STEAM TURBINES
E. Koch 4 Feb. 1974 19 p Transl. into ENGLISH from Mitt. der Ver. Grosskesselbesitzer (West Germany), v. 52, no. 6, Dec. 1972 p 451-458
(BLL-CE-Trans-6217-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The limit output of condensing steam turbines is determined by the length of the moving blade. This limit output is increased not only by the end-stage, but by improvement of the process efficiency and by increasing the exhaust pressure. Further development of the steam process is discussed in terms of the increase in live steam conditions, expansion of feedwater heating, introduction of reheating, and the improvement of turbine efficiency by means of better blade profiles. The development of end-stage blades is presented. Problem areas in aerodynamic design, blade strength, location of natural frequencies, and erosion behavior are discussed. J.M.S.

N75-17680 British Library Lending Div., Boston Spa (England).
THE STEEL CONSTRUCTION OF THE 100-m RADIOTELESCOPE IN EFFELSBERG
H. Altmann 9 Jul. 1974 30 p refs Transl. into ENGLISH from Der Stahlbau (West Germany), v. 11-12, 1972 p 19
(BLL-Risley-TR-2770-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The structural design of the largest moving radio telescope in the world is described with emphasis on the steel construction. Topics discussed include: design of the main support system, structural analysis, wind tunnel tests, ice and snow loads, and reflector support. F.O.S.

N75-17681 Polish Academy of Sciences, Warsaw.
A PROGRAM FOR DETERMINING THE FREQUENCY OF NATURAL VIBRATIONS IN MULTIPLE FRONTAL COGGED GEARS [PROGRAM WYZNACZANIA CZESTOSCI DRGAN WLASNYCH WIELOKROTNEJ CZOLOWEJ PRZEKLADNI ZEBATEJ]
Andrzej Olas 22 Jan. 1974 43 p refs In POLISH
(Rept-4/7974) Avail: Issuing Activity

The problem of constructing a mathematical model of a multiple cogged gear is presented along with a program for determining the resonant curve of such a gear. Other topics discussed include linear equations, natural vibrations, data tables, and trigonometric functions. Transl. by M.J.S.

N75-17682*# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering.
EROSION IN RADIAL INFLOW TURBINES. VOLUME 4: EROSION RATES ON INTERNAL SURFACES Final Report
W. B. Clevenger, Jr. and W. Tabakoff Jan. 1975 41 p refs (Grant NGR-36-004-055)
(NASA-CR-134677) Avail: NTIS HC $3.75 CSCL 21E

An analytic study of the rate at which material is removed by ingested dust impinging on the internal surfaces of a typical radial inflow turbine is presented. Results show that there are several regions which experience very severe erosion loss, and other regions that experience moderate levels of erosion loss: (1) the greatest amount of material loss occurs on the trailing edges of the nozzle blades where very high velocity, moderate angle impacts occur. The tip regions of ductile materials are also subjected to serious levels of erosion loss; (2) moderate amounts of erosion occur near the end of the scroll and on a few of the nozzle blades near this location. Results are presented in the form of surface contours that exist on the scroll and blade surfaces after continuous particulate ingestion with time. Author

N75-17683*# Bendix Corp., Teterboro, N.J. Guidance Systems Div.
ATM CMG BEARING FAILURE ANALYSIS Final Report
Jan. 1975 304 p refs
(Contract NAS8-20661)
(NASA-CR-120607; Rept-6401-75-R06) Avail: NTIS HC $9.25 CSCL 13I

The cause or causes for the failure of ATM CMG S/N 5 (Skylab 1) and the anomalies associated with ATM CMG S/N 6 (Skylab 2) were investigated. Skylab telemetry data were reviewed and presented in the form of parameter distributions. The theory that the problems were caused by marginal bearing lubrication was studied along with the effects of orbital conditions on lubricants. Bearing tests were performed to investigate the effect of lubricant or lack of lubricant in the ATM CMG bearings and the dispersion and migration of the lubricant. The vacuum and weightless conditions of space were simulated in the bearing tests. Analysis of the results of the tests conducted points to inadequate lubrication as the predominant factor causing the failure of ATM CMG S/N 5 (Skylab 1) and the anomalies associated with ATM CMG S/N 6 (Skylab 2). J.M.S.

N75-17684*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A MAGNETIC TORQUING SYSTEM FOR EMERGENCY STABILIZATION AND BACKUP CONTROL OF THE LST
Michael E. Polites Feb. 1975 16 p refs
(NASA-TM-X-64912) Avail: NTIS HC $3.25 CSCL 13I

A magnetic torquing system for emergency stabilization and backup control of the Large Space Telescope is described. The system uses magnetic torquers, a magnetometer, and rate gyros. Simulation results are presented to verify the scheme. Author

N75-17685# Joint Publications Research Service, Arlington, Va.
ELECTROSLAG CASTING
B. Ye. Paton, B. I. Medovar, and G. A. Boyko 15 Jan. 1975 66 p refs Transl. into ENGLISH from the book "Elektroshlakovoye Lit'ye", 2 Aug. 1974 p 1-70
(JPRS-63884) Avail: NTIS HC $4.25

Important characteristics of the physico-mechanical properties of electroslag cast metal are examined and compared to the properties of open hearth steel which was subjected to deformation by forging or used on the cast form. Author

N75-17686*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF NUMBER OF LOBES AND LENGTH-DIAMETER RATIO ON STABILITY OF TILTED-LOBE HYDRODYNAMIC JOURNAL BEARINGS AT ZERO LOAD
Fredrick T. Schuller Washington Mar. 1975 21 p refs
(NASA-TN-D-7902; E-8025) Avail: NTIS HC $3.25 CSCL 13I

Hydrodynamic journal stability tests were conducted with tilted-lobe bearings. The bearings had three, five, and seven lobes and length to diameter (L/D) ratios from 0.2 to 1.0. They were tested in water and MIL-L-7808G oil at 294 K (70 F) at speeds to 5400 rpm with zero load. Stability was not appreciably affected by the number of lobes and decreased with a decrease in L/D ratio. However, a three-tilted-lobe bearing with an offset factor of 0.76 and an L/D of 0.5 was more stable than a three centrally lobed bearing with an offset factor of 0.50 and an L/D of 1.0. Author

N75-17687*# State Univ. of New York, Stony Brook. Coll. of Engineering.
THERMODYNAMICS AND KINETICS OF REACTIONS IN PROTECTIVE COATING SYSTEMS Semiannual Report, 1 Dec. 1973 - 31 May 1974
B. Gupta, A. Sarkhel, R. Sivakumar, and L. Seigle 31 May 1974 39 p refs
(Grant NGR-33-015-160)
(NASA-CR-136760; SAR-3) Avail: NTIS HC $3.75 CSCL 11C

Investigations of fluoride activated packs with Al:Ni ratios greater than 50 a/o prove that the specimen surface is not in equilibrium with the pack at high Al:Ni ratios but that an activity gradient exists between pack and specimen. Therefore, gaseous diffusion and possibly surface reactions play a role in determining the overall rate of Al deposition in such packs. Noticeable differences in coating behavior have been obtained in packs activated with chloride and iodide, and it appears that poorest results are obtained with iodides, better with chlorides, and best with fluorides. A numerical method has been perfected for calculating rates of solid-state diffusion controlled coating formation, allowing for the variation of diffusivity with composition in the NiAl phase. Layer growth rates can now be accurately predicted from a knowledge of the surface and substrate compositions. Furthermore, the correct diffusion profiles are obtained by this method. These differ substantially from the profile obtained when the diffusivity is assumed constant. Author

N75-17688# Sandia Labs., Albuquerque, N.Mex.
TEST OF A MAGNETIC BEARING FOR OPTICAL SCANNER APPLICATIONS
R. E. Abbink Sep. 1974 14 p ref
(Contract AT(29-1)-789)
(SLA-74-0347) Avail: NTIS HC $3.25

An electro-optical measurement technique is described for the determination of angular stability of a rotating shaft. Demonstrated measurement resolution is on the order of 0.1 arc second. This technique is applied to the performance evaluation of a development model, radially passive, magnetic bearing system. Results are discussed in terms of using this type of bearing system in a high resolution optical scanner. Author (NSA)

N75-17689# Bendix Corp., Kansas City, Mo.
AUTOMATIC MACHINE APPLICATION OF SOLID FILM LUBRICATION
G. P. Miller Sep. 1974 11 p refs
(Contract AT(29-1)-613)
(BDX-613-1169) Avail: NTIS HC $3.25

An automatic machine was fabricated and initially evaluated to apply lubricants within narrow tolerances. The machine employs a turntable with ten stations which rotate independently of the turntable; a control panel; a mixing pot; and a spray nozzle. Using Electrofilm 4396 diluted with dioxane, 65 runs of ten samples each were coated. The anticipated thickness was achieved on 92.3 percent of the coated samples. The lubricant thickness varied 0.0001 inch (2.54 micron) or less on 52 of the 65 runs, and the maximum variation for all runs was 0.00022 (5.59 micron). Author (NSA)

N75-17690# California Univ., Livermore. Lawrence Livermore Lab.
PNEUMATIC LOGIC INTERFACE FOR VALVE THROTTLING
C. E. Hugenberger 25 Jul. 1974 16 p refs Presented at 21st Natl. Symp. of the Am. Vacuum Soc., Anaheim, Calif., 19 Oct. 1974
(UCRL-75716; Conf-741015-5) Avail: NTIS HC $3.25

A description is given of pneumatic logic used as a logic interface to modify the air signals to an ordinary pneumatic valve so that both manual and automatic controls are available to the user. Because electrically controlled logic systems dominate the field, the circuit described is designed to be compatible with such systems without modification. NSA

N75-17691# Mound Lab., Miamisburg, Ohio.
SAFETY ANALYSIS REPORT FOR PACKAGING (SARP): MULTIHUNDRED WATT ISOTOPE HEAT SOURCE SHIPPING CONTAINER (MHW-IHS-SC)
J. F. Griffin, E. W. Johnson, L. F. Rodriguez, and D. L. OBrien 28 Jun. 1974 277 p refs
(Contract AT-33-1-GEN-53)
(MLM-2074) Avail: NTIS HC $8.75

The technical information and limits pertinent to the construction and use of the Multi-Hundred Watt (MHW) Isotope Heat Source shipping container are presented. Discussions of structural integrity, thermal resistance, radiation shielding and radiological safety, nuclear criticality safety, and quality control are included. A complete physical and technical description of the package is presented. The results of the nuclear criticality safety analysis show that 6.3 kg of Pu may be shipped as Fissile Class I, whereas the MHW heat source contains only

5.3 kg of total plutonium. Design and development considerations, the tests and evaluations required to prove the capability of the containers to withstand normal transportation conditions, and the sequence of hypothetical accident conditions (free drop, puncture, thermal and water immersion), are discussed.
Author (NSA)

N75-17692# European Space Research Organization, Paris (France).
STUDY OF ELECTROHYDRAULIC CONTROL VALVES WITH FLUIDIC BALL ELEMENTS
Karl-Heinz Post Dec. 1974 148 p refs Transl. into ENGLISH of Untersuch. an Elektrohydraulischen Schaltventilen mit Fluidischen Kugelelementen, DLR-FB-73-35, DFVLR, 17 Jan. 1973
(ESRO-TT-112; DLR-FB-73-35) Avail: NTIS HC $5.75; DFVLR, Porz, West Ger. 25.50 DM

Fluidically controlled ball elements have advantages in respect to functional reliability, life, leakproof application at high pressures, and high switching speed. They are suitable for hydraulic logic circuits and multistage directional valves. A basic study of the flow and flow forces in ball valves was made. The switching conditions, adaption of connected elements, and measured operating times of fluidic ball elements are given. To achieve extremely short switching times in multistage solenoid operated ball valves, the dynamic behavior of electromagnetic drives was investigated. The practical application of this new valve technology was demonstrated in fabricated prototypes of two-stage electrohydraulic ball valves. Author (ESRO)

N75-17693# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELECTRONIC SIMULATION OF A METHOD FOR IMPROVING DRIVE DAMPING OF FORCED OSCILLATIONS OF A MECHANISM
D. A. Kaminskaya, N. N. Grigoreva, and V. D. Dmitrienko 18 Oct. 1974 12 p refs Transl. into ENGLISH from Pribory Sistemy Avtomat. (USSR), no. 25, 1973 p 161-166
(AD-A000625; FTD-HC-23-2387-74) Avail: NTIS CSCL 13/9

A method is presented which provides improvement of drive damping of forced oscillations of a mechanism by introducing a feedback signal according to the difference in velocities of the driving and driven shafts of the machine sets. Limitations of the dynamic stresses in the mechanism are permitted in the oscillation mode independent of the relationship between moments of inertia of the mechanism and drive and independent of the relationship between the electromechanical time constant and the frequency of the natural oscillations of the mechanism. A high efficiency of drive damping of the forced oscillations of the mechanism is maintained for nonstationary oscillations of the mechanism. Oscillograms illustrating the nature of the processes in the machine set in the response passage modes and the damping feedback disconnected and connected are presented.
J.M.S.

N75-17694# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
WELDING BY IMPACT
21 Oct. 1974 7 p Transl. into ENGLISH from Sots. Industr. (USSR), no. 191, 1973 p 4
(FTD Proj. T74-01-40; FTD Proj. T74-01-41)
(AD-A000627; FTD-HC-23-2542-74) Avail: NTIS CSCL 13/8

The component, propelled to a speed up to 300 meters a second and with more pressure from the impulse magnetic field, collides with another immovable component and a simple bond is formed between the contact surface, analogous to the bonds in basic metals. By this method it is possible to form connections between pipes with varying wall thicknesses, pipes with cylindrical rods and flanges since the thickness of cast components may be from 22 to 4 millimeters (with a diameter from 8 to 200mm) and with the immovable an unlimited wall thickness may exist.
GRA

N75-17695# Rock Island Arsenal Lab., Ill. Thomas J. Rodman Lab.
THE APPLICATION OF HEAT AND CORROSION RESISTANT PHOSPHATE COATINGS UNDER STEAM PRESSURE
Linden H. Wagner Mar. 1974 48 p refs
(DA Proj. 1A2-23035-03-M1-M2)
(AD-A000633; RIA-R-TR-74-012) Avail: NTIS CSCL 11/3

Processing methods to produce zinc and manganese phosphate coatings with greater heat and corrosion resistance on ferrous items were investigated. Conventional phosphating solutions enriched with salts of the alpha-reactive-carboxylic-acids, such as manganese salts of citric, tartaric, and gluconic acids were processed under steam and atmospheric pressure. Manganese carbonate and manganese dihydrogen phosphate were added to control the free and total acids. Evaluations were made of the coating weight, amount of iron etched from the surface, loss of coating weight due to thermal exposure, and resistance of the coatings to heat and corrosion in the salt-spray tests. (Modified author abstract) GRA

N75-17696# Goodyear Tire and Rubber Co., Akron, Ohio.
STUDIES OF DETERIORATION OF COATINGS FOR COLLAPSIBLE FUEL TANKS, PART 2 Final Report, Mar. - Oct. 1974
T. W. Chalmers Oct. 1974 51 p refs
(Contract DAAK02-74-C-0011; DA Proj. 1G7-62708-AH-67)
(AD-A000908) Avail: NTIS CSCL 11/3

The first phase program revealed that only the combat gasoline soak test, exposure to combat gasoline in combination with ultraviolet radiation and high humidity, and exposure to diesel fuel in combination with ultraviolet radiation and high humidity showed sufficient deterioration of the polymer coatings for further evaluation. In all three of the exposure tests, the effect of not changing the fuel periodically caused more severe degradation of the coating materials than when the fuels were changed at each two-week period. The probable cause of the increased deterioration of the coatings in combat gasoline was the change in composition of the test fluid caused by volatilization of the lower boiling fractions. The probable cause of the increased deterioration of the coatings in diesel fuel was the change in pH of the fuel due to exposure to ultraviolet radiation and moisture.
GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N75-17697 British Library Lending Div., Boston Spa (England).
A REPORT BY THE WEATHERABILITY TEST COMMITTEE OF THE PLASTICS STANDARD TESTS RESEARCH ASSOCIATION JAPAN
Yoichi Minematsu, Mikio Murayama, and Hiroyuki Kurumiya 3 Dec. 1973 30 p refs Transl. into ENGLISH from Purasuchikkusu (Japan), v. 23, no. 5, 1972 p 13-23
(BLL-Kirkby-TR-61-(9022.49)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

A program devised to investigate differences among different types of test equipment in testing weatherability of plastics is presented. Special attention was given to deterioration of high polymer materials and accelerated life tests. Discrepancies between artificial accelerated testing machines and geographical outdoor exposure sites are examined along with the effects of light source spectral distribution on weathering. Author

N75-17698# Lockheed Missiles and Space Co., Palo Alto, Calif.
AUTOMATIC SYSTEMS OF CHECKING OPERABILITY
E. B. Volkov, R. S. Sudakov, and T. A. Syritsyn [1975] 6 p Transl. into ENGLISH from the book "Osnovy Teorii Nadezhnosti Raketnykh Dvigatelei" Moscow, Mashinostroenie, 1974 p 290-296
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Automatic systems, for determining operability, detecting imperfections, recognizing faults, and predicting changes in the state of the object being checked without human participation, are examined. Attempts were also made to solve problems of utilization-engineering control. E.H.W.

N75-17699# Lockheed Missiles and Space Co., Palo Alto, Calif.
REDUNDANCY AS A METHOD OF RAISING ENGINE RELIABILITY, CHAPTER 8
E. V. Volkov, R. S. Sudakov, and T. A. Syritsyn [1975] 17 p refs Transl. into ENGLISH from the book "Osnovy Teorii Nadezhnosti Raketnykh Dvigatelei" Moscow, Mashinostroenie, 1974 p 337-351
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The quantitative characteristics of redundancy methods which can be used to raise engine reliability are examined. The redundancy methods included were: (1) separate redundancy with a permanently connected standby; (2) total redundancy with a permanently connected standby; and (3) redundancy by substitution with a sliding 'cold' standby. It is concluded that to assure the operability and reliability of the redundant power plant, it is necessary to use emergency protection systems which determine the engine state and disconnect them when failure occurs, thereby protecting the adjacent engines from the effect of the failed engines. J.M.S.

N75-17700# Army Foreign Science and Technology Center, Charlottesville, Va.
PROSPECTS FOR CONSTRUCTING A STRENGTH CRITERION FOR COMPLEX LOADS
V. V. Novozhilov and O. G. Rybakina 31 Jul. 1974 18 p refs Transl. into ENGLISH from the monograph "Prochnost pri Malom Chisle tsiklov Nagruzh. Vop. Mekh. Ustal." Moscow, 1969
(AD-A001494; FSTC-HT-23-0663-74) Avail: NTIS CSCL 11/6

The discussion and investigation into a preliminary mathematical model for the strength criterion to be used during simple and symmetric cyclic loading. The criterion covers several cases of loading, simple loading, when the results obtained are close to those in the Davidenkov - Fridman theory, and in the symmetric cyclic loading when results are similar to those obtained using the Koffin criterion. Much work is still to be done in connection with this new criterion, since it is by no means conclusive or indisputable. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N75-17701 British Library Lending Div., Boston Spa (England).
THE CORROSION RESISTANCE OF ALUMINIUM-STEEL AND ALUMINIUM-COPPER WELDED JOINTS
W. R. Rjabow and L. M. Sotowa 1974 16 p refs Transl. into ENGLISH from Schweisstech. (Berlin), v. 22, 1972 p 246-249
(BLL-M-23622-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Sea water corrosion resistance tests on welded joints of aluminum based materials with steel, and on aluminum/copper/brass welds are reported. Results indicate that all welded joints need protective coatings when being used in a marine climate. Author

N75-17702 Naval Research Lab., Washington, D.C. Shock and Vibration Information Center.
THE SHOCK AND VIBRATION DIGEST, VOLUME 6, NO. 8
Henry C. Pusey, ed. and Robert Belsheim, ed. Aug. 1974 91 p refs
(AD-784295) Avail: Director, Navy Publ. and Printing Service Office, Naval District of Washington, Building 157-2, Washington Navy Yard, Washington, D. C. 20390: $15.00/set CSCL 20/11

A bibliography of technical documents on shock and vibration is presented. Some of the subjects discussed are: (1) nonlinearities in structural dynamics, (2) vibration isolation and damping, and (3) noise control technology. Abstracts from current literature are included for broad subjects such as analytical methods of structural design, integral transforms, optimization techniques, finite element modeling, and fluid dynamics. Author

N75-17703 Polish Academy of Sciences, Warsaw.
OPTIMALIZATION OF FLAT BAR-GRID STRUCTURES [OPTYMALIZACJA PLASKICH PRETOWYCH USTROJOW SIATKOWYCH (I)]
Jacek Gierlinski 8 Oct. 1973 32 p refs In POLISH
(Rept-42/1973) Avail: Issuing Activity

The optimalization of lattice grid structures is discussed based on data obtained from a volume of construction materials. The optimalization is accomplished in order to obtain a structural configuration whose deformability, characterized by the energy of elastic deformation, is slight. Other topics discussed include types of lattice grids, optimalization parameters, and differential calculus. Transl. by M.J.S.

N75-17704 Polish Academy of Sciences, Warsaw.
PROBLEM OF OPTIMIZING STRUCTURES OF DIFFUSED, COMPRESSED TENSION RODS [ZAGADNIENIE OPTYMALIZACJI USTROJOW O ROZPROSZONYCH CIEGNACH]
Jan Holnicki-Szulc and Wojciech Marks 8 Jan. 1974 27 p refs In POLISH
(Rept-1/1974) Avail: Issuing Activity

An analysis is presented of previous work on the problem of structural optimalization and of suggestions for obtaining solutions. Equations are derived which describe compressed media and compressing tension rods. The criteria for optimalization are presented along with the minimum for construction deformability and equalization of the main tensions in plane stress-state structures. Transl. by M.J.S.

N75-17705 Polish Academy of Sciences, Warsaw.
FINITE ELASTIC-PLASTIC DEFORMATION AND LOSS OF STABILITY DURING BENDING [SKONCZONE ODKSZTALCENIA SPREZYSTO-PLASTYCZNE I UTRATA STATECZNOSCI PRZY ZGINANIU]
Janusz Mielniczuk 14 Jan. 1974 65 p refs In POLISH
(Rept-3/1974) Avail: Issuing Activity

It is shown that plasticizing of hyper-elastic material takes place when tensions in the actual configurations satisfy the conditions of plasticity. Greene and Zern solutions to the problem are presented. Problems of bifurcation and the stability of the process of finite plastic deformation are discussed along with the theory of plasticity. Transl. by M.J.S.

N75-17706*# Techtran Corp., Glen Burnie, Md.
JUSTIFICATION OF THE DYNAMIC METHOD OF STUDYING ELASTIC SYSTEMS
Ya. S. Podstrigach, D. A. Baydak, and L. M. Zoriy Washington NASA Feb. 1975 5 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 214, no. 5, 11 Feb. 1974 p 1049-1051
(Contract NASw-2485)
(NASA-TT-F-15886) Avail: NTIS HC $3.25 CSCL 20K

Development of an approach to proving the validity of the dynamic method of studying the vibrations and stability of deformable systems. It is shown that the existence and uniqueness of the solution to the mixed problem describing the perturbed motions of such a system can be demonstrated on the basis of certain theorems for a linear eigenvalue problem which in the general case is a nonself-adjoint multiparametric problem. Author

N75-17707# National Aerospace Lab., Tokyo (Japan).
ON THE NATURAL VIBRATION OF PLATE-BEAM COMBINATION STRUCTURES, 4
Taketoshi Hanawa and Keiji Komatsu 1974 39 p refs In JAPANESE; ENGLISH summary
(NAL-TR-363) Avail: NTIS HC $3.75

The application of an analytical method, by use of the Ramyleigh-Ritz procedure, to the analysis of natural vibration characteristics in plate-beam structures is considered. As actual examples, structures consisting of built-up wings with an aspect ratio of about 9 and a cylindrical fuselage were dealt with. General analytical equations were formulated for these. Numerical examples were considered for models consisting of combination

beam, cantilevered built-up wing, and boomerang type wings applying the formula to these special cases and a model consisting of a cylindrical fuselage and built-up wings. At the same time, vibration tests of these models were carried out. Comparisons of both results showed that there were fairly good correlations between them, though there are some troubles, which were examined numerically, in the calculation of the eigenvalues. It is concluded that this analytical method cannot be overlooked, as it is one of the most suitable ways of predicting vibration characteristics of these structures in the earlier design phase, although the powerful matrix method is widely applied to these complicated or real airplane structures. Author

N75-17708*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN AUTOMATED PROGRAM FOR REINFORCEMENT REQUIREMENTS FOR OPENINGS IN CYLINDRICAL PRESSURE VESSELS

John F. Wilson and John T. Taylor Jan. 1975 48 p refs

(NASA-TM-X-72648) Avail: NTIS HC $3.75 CSCL 20K

An automated interactive program for calculating the reinforcement requirements for openings in cylindrical pressure vessels subjected to internal pressure is described. The program is written for an electronic desk top calculator. The program calculates the required area of reinforcement for a given opening and compares this value with the area of reinforcement provided by a proposed design. All program steps, operating instructions, and example problems with input and sample output are documented. Author

N75-17709*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STRUCTURAL RESPONSE OF A FIBER COMPOSITE COMPRESSOR FAN BLADE AIRFOIL

C. C. Chamis and M. D. Minich (Cleveland State Univ.) 1975 34 p refs Presented at Gas Turbine Conf. and Prod. Show, Houston, Tex., 2-6 Mar. 1975

(NASA-TM-X-71623; E-8147) Avail: NTIS HC $3.75 CSCL 20K

A theoretical investigation was performed to determine the structural response of a fiber composite airfoil typical of those encountered in high-tip speed compressor fan blades when subjected to load conditions anticipated in such applications. The analysis method consisted of composite mechanics embedded in pre- and post-processors coupled with NASTRAN. The load conditions examined include thermal due to aerodynamic heating, pressure due to aerodynamic forces, and centrifugal. Root reactions due to various load conditions, average composite and ply stresses, ply delaminations, and the fundamental modes and the corresponding reactions were investigated. The results show that the thermal and pressure stresses are negligible compared to those caused by the centrifugal forces. The core-shell concept for composite blades is an inefficient design and is sensitive to interply delaminations. The results are presented in graphical and tabular forms to illustrate the types and amount of data required for the analysis, and to provide quantitative data associated with the various responses which can be helpful in designing composite blades. Author

N75-17710*# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.

ANALYSIS OF EDGE IMPACT STRESSES IN COMPOSITE PLATES Topical Report, May 1973 - May 1974

F. C. Moon and C. K. Kang Jul. 1974 78 p refs

(Grant NGR-31-001-267)

(NASA-CR-134720; AMS-1141) Avail: NTIS HC $4.75 CSCL 20K

The in-plane edge impact of composite plates, with or without a protection strip, is investigated. A computational analysis based on the Fast Fourier Transform technique is presented. The particular application of the present method is in the understanding of the foreign object damage problem of composite fan blades. The method is completely general and may be applied to the study of other stress wave propagation problems in a half space. Results indicate that for the protective strip to be effective in reducing impact stresses in the composite the thickness must be equal or greater than the impact contact dimension. Large interface shear stresses at the strip - composite boundary can be induced under impact. Author

N75-17711*# Clemson Univ., S.C. Mechanical Engineering Dept.

OPTIMIZATION OF STRUCTURES TO SATISFY A FLUTTER VELOCITY CONSTRAINT BY USE OF QUADRATIC EQUATION FITTING M.S. Thesis

Saifee K. Motiwalla 6 Feb. 1973 42 p refs

(Grant NGR-41-001-027)

(NASA-CR-132628) Avail: NTIS HC $3.75 CSCL 20K

Using the first and the second derivative of flutter velocity with respect to the parameters, the velocity hypersurface is made quadratic. This greatly simplifies the numerical procedure developed for determining the values of the design parameters such that a specified flutter velocity constraint is satisfied and the total structural mass is near a relative minimum. A search procedure is presented utilizing two gradient search methods and a gradient projection method. The procedure is applied to the design of a box beam, using finite-element representation. The results indicate that the procedure developed yields substantial design improvement satisfying the specified constraint and does converge to near a local optimum. Author

N75-17712*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STRUCTURAL ANALYSIS OF WIND TURBINE ROTORS FOR NSF-NASA MOD-0 WIND POWER SYSTEM

David A. Spera Washington Mar. 1975 39 p refs

(NASA-TM-X-3198; E-8133) Avail: NTIS HC $3.75 CSCL 20K

Preliminary estimates of vibratory loads and stresses in hingeless and teetering rotors for the proposed 100-kW wind power system are presented. Stresses in the shank areas of the 19-m (62.5-ft) blades are given for static, rated, and overload conditions. The teetering rotor has substantial advantages over the hingeless rotor with respect to shank stresses, fatigue life, and tower loading. A teetering rotor will probably be required in order to achieve a long service life in a large wind turbine exposed to periodic overload conditions. Author

N75-17713# Ktech Corp., Albuquerque, N. Mex.

STRESS WAVE MEASUREMENTS IN A HIGH NOISE ENVIRONMENT Final Report, Oct. 1972 - Dec. 1973

William G. Butters and Boyd D. Jenrette Sep. 1974 64 p refs

(Contract F29601-73-C-0023; AF Proj. 627A)

(AD-786892; AFWL-TR-74-109) Avail: NTIS CSCL 14/2

Thin flyers accelerated by magnetic repulsion have been used extensively for studying the response of materials to shock-wave and structural loadings. Analysis of the resulting behavior requires experimental parameters to be actively monitored and recorded. Measurement of the stress loading introduced into the sample and the resulting transmitted profile has been limited due to the severe electrical and shock environment of the tests. This document outlines the modification of an existing carbon gauge concept to allow its use in high electrical noise environment. Data are presented as stress versus time history of several types of experimental configuration. Included is a brief analysis showing correlation between theoretical and experimental data. (Modified author abstract) GRA

N75-17714# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE RELATIONSHIP BETWEEN THE STATE OF A SUBSTANCE UNDER THE CONDITIONS OF DYNAMIC COMPRESSION AND THE RESULTS OBTAINED DURING THE INVESTIGATION OF PRESERVED SAMPLES

G. A. Adadurov, T. V. Bavina, O. N. Breusov, V. N. Drobyshev, and S. V. Pershin 23 Oct. 1974 16 p Transl. into ENGLISH from the book "Gorenie i Vzryv" Moscow, 1972 p 523-528

(AD-A000362; FTD-MT-24-1982-74) Avail: NTIS CSCL 14/2

The action of shock compression on crystalline substances was studied along with the correlation of results obtained in dynamic experiments. Point defects, twinning, vacancies, and increase in dislocation density are discussed. F.O.S.

N75-17715# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
APPLICATION OF KHASMINSKII'S LIMIT THEOREM TO THE BUCKLING PROBLEM OF A COLUMN WITH RANDOM INITIAL DEFLECTIONS
B. P. Videc and J. Lyell Sanders, Jr. May 1974 16 p refs
(Grants AF-AFOSR-2476-73; NSF GP-34723; AF Proj. 9782)
(AD-A000539; DEAP-S-9; AFOSR-74-1696TR) Avail: NTIS CSCL 13/3

An approximate asymptotic expression is obtained for the buckling load of an imperfect column resting on a nonlinear elastic foundation. The result holds for a large range of imperfection shapes, which are assumed to be stationary random functions of position. The asymptotic analysis is based on application of Khas'minskii's limit theorem to equations for the slowly varying part of the deflection of the column. Previous results obtained for Gaussian imperfection shapes are shown to be valid also for the larger class of random imperfections considered here. Author (GRA)

N75-17716# Lehigh Univ., Bethlehem, Pa.
A FRACTURE CRITERION FOR THREE DIMENSIONAL CRACK PROBLEMS
G. C. Sih and B. C. Cha Jun. 1974 60 p refs
(Contract N00014-68-A-0514)
(AD-A000435) Avail: NTIS CSCL 20/12

A criterion for predicting the growth of three-dimensional cracks is developed on the basis of the strain energy density concept which has been used successfully for treating two-dimensional crack problems. An example of failure prediction for an embedded elliptical crack subjected to both normal and shear loads is presented. (Modified author abstract) GRA

N75-17717# Watervliet Arsenal, N.Y.
THE MEASUREMENT AND ANALYSIS OF FATIGUE CRACK GROWTH IN THICK-WALLED CYLINDERS
J. J. Miller, D. C. Winters, and R. R. Fujczak Sep. 1974 20 p refs
(AD-A000689; WVT-TR-74040) Avail: NTIS CSCL 11/6

A technique has been developed for the accurate measurement of crack depth in thick-walled cylinders using a straight-beam ultrasonic probe. This technique has proved useful not only under laboratory conditions, but also in practical situations such as inspection of cannon tubes after firing. In the presence of multiple cracks, the measurement, recording and analysis of all the factors of fatigue crack growth can be quite complicated. To alleviate this problem a system for the rapid collection reduction, and analysis of this data by computer has been developed. The resulting measuring devices, the data acquisition system and the link to an IBM 360 computer is described. Various computer programs used to process the data and illustrating the kind of information and graphical output that can be generated are described. This includes a graphic representation of all the cracks present showing their location and depth. The importance of the rapid data analysis feature of the system to apply fracture mechanics theory for the control of the fracture process in thick walled cylinders is demonstrated. GRA

N75-17718# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DEFORMATION OF A MULTILAYER SHELL OF REVOLUTION UNDER ANISOTHERMAL LOADING
V. S. Bondar and V. P. Korobov 21 Oct. 1974 16 p refs Transl. into ENGLISH from Prikl. Mekh. (USSR), v. 9, no. 3, Mar. 1973 p 49-55
(AD-A000438; FTD-HC-23-1513-74) Avail: NTIS CSCL 20/11

The report considers the elastoplastic stress-deformed condition, taking transitory creep into account, of a momentless multilayer shell of revolution under the action of an unsteady axisymmetric power and temperature load. It considers the temperature along the thickness of each layer to be constant but different for each layer. GRA

N75-17719# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A USER'S MANUAL TO COMPUTE SHOCK REFLECTIONS IN ELASTIC SOLIDS
G. H. Jonas Sep. 1974 72 p refs
(DA Proj. 1W1-62113-A-660)
(AD-A001535; BRL-MR-2409) Avail: NTIS CSCL 20/12

A computer program in FORTRAN language for shock reflections in elastic solids is presented. Brief descriptions of the equations, input and program logic are included. A sample problem is given to display input and output. GRA

N75-17720# Army Foreign Science and Technology Center, Charlottesville, Va.
STRESSES IN A SPHERICAL SHELL UNDER AXISYMMETRIC HEATING
V. D. Afinogenov 16 May 1974 8 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 1, Mat. Mekh. (USSR), no. 2, 1968 p 95-98
(AD-A001451; FSTC-HT-23-1639-72) Avail: NTIS CSCL 20/11

Solutions are given to differential equations used to determine stresses in shells of rotation under the assumption that the temperature varies linearly through the wall. Author

N75-17721# Army Foreign Science and Technology Center, Charlottesville, Va.
UNIT FOR STUDYING THE STRENGTH AND DEFORMABILITY OF HIGH-STRENGTH BRITTLE MATERIALS IN BIAXIAL COMPRESSION
G. M. Okhrimenko and Yu. M. Rodichev 15 May 1974 8 p Transl. into ENGLISH from Probl. Prochnosti Mashinostr. (USSR), no. 1, 1973 p 122-124
(AD-A001493; FSTC-HT-23-0672-74) Avail: NTIS CSCL 11/2

A unit for studying the strength and deformability of brittle materials such as glass, ceramics and pyroceram in laboratory conditions is presented. The sample is placed into the unit and biaxial forces are applied to it. Various instruments, cinecameras, potentiometers, strain gauges, etc. record the disintegration process and an oscillograph and a filter register the moment prior to disintegration. GRA

N75-18021 Joint Publications Research Service, Arlington, Va.
NONLINEAR THEORIES OF ELASTICALLY DEFORMABLE SOLIDS, LIQUIDS AND GASES IN CARTESIAN COORDINATES
U. K. Nigul and Yu. K. Engelbrekht *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 176-192 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 233-253 (For availability see N75-18013 09-70)

N75-18022 Joint Publications Research Service, Arlington, Va.
LINEAR ELASTICITY THEORY
U. K. Nigul and Yu. K. Engelbrekht *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 193-204 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 254-268 (For availability see N75-18013 09-70)

N75-18024 Joint Publications Research Service, Arlington, Va.
NONLINEAR AND LINEAR THEORIES OF AXIALLY SYMMETRIC DEFORMATION OF THIN ELASTIC SHELLS OF REVOLUTION
A. Ya. Lakhe *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Feb. 1975 p 208-226 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 273-295 (For availability see N75-18013 09-70)

42 GEOSCIENCES (GENERAL)

N75-17722 British Library Lending Div., Boston Spa (England).
EXPLORATION OF ANTARCTICA: PAST AND PRESENT
E. Tolstikov 18 Jan. 1974 4 p refs Transl. into ENGLISH from Prauda (Moscow), 29 Dec. 1974
(BLL-M-23343-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Discoveries of the Soviet explorers in the Antarctic are discussed. The economic potential including mineral, coal, oil and gas mining are briefly discussed along with the hunting and fishing potential. F.O.S.

N75-17723 British Library Lending Div., Boston Spa (England).
ANOMALIES IN ICE-COVER, AND THE POSITION OF THE ICE EDGE, ON THE ATLANTIC FRINGES OF THE ARCTIC, AS CONNECTED WITH THE DEVELOPMENT OF ATMOSPHERIC AND OCEANIC PROCESSES
A. A. Lebedev and N. S. Uralov 1974 9 p Transl. into ENGLISH from Polj. Nauc.-Issled. Proakt. Inst. Morsk. Rybn. Hozj. Okean. (Murmansk), v. 19, 1972 p 169-179
(BLL-M-23324-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The seasonal changes in ice conditions and the location of the ice edge in 1968-69 are considered. For estimating ice conditions, meteorological charts based mainly on satellite data were used. Monthly anomalies relative to the norm for 1925-1966 were calculated in the analysis of seasonal variations. A clearly defined opposition of ice conditions was found in 1968-69 within the seas bordering the North Atlantic, with the Berents and Greenland Seas showing ice appreciably above the norm, while quantities of ice in the Northwest Atlantic were below the norm. Connections between atmospheric and oceanic processes with the formation of the anomalies are examined. N.E.R.

N75-17724# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 342
5 Feb. 1975 42 p Transl. into ENGLISH from Russian reports
(JPRS-64032) Avail: NTIS HC $3.75

Translations and abstracts are reported, describing articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics. Published details of Soviet space activities are also included. Author

N75-17725# Joint Publications Research Service, Arlington, Va.
ACOUSTICS OF THE OCEAN, PART 1
L. M. Brekhovskikh, ed. 31 Jan. 1975 205 p refs Transl. into ENGLISH of the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 694 p
(JPRS-64008-1) Avail: NTIS HC $7.25

Oceanographic features which are important for the understanding of the acoustics of the ocean are examined. Both theoretical and experimental modern research on acoustical fields in the ocean is discussed. For individual titles, see N75-17726 through N75-17736.

N75-17726 Joint Publications Research Service, Arlington, Va.
OCEAN FLOOR c48
N. S. Ageyev, I. B. Andreyeva, V. I. Volovov, Yu. Yu. Zhitkovskiy, S. D. Chuprov, and R. F. Shvachko *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 1-16 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 19-32 (For availability see N75-17725 09-42)

The use of underwater photography and echo sounding to study the geology and geophysics of the ocean bottom is described. A.L.

N75-17727 Joint Publications Research Service, Arlington, Va.
SUBSURFACE WAVES c48
N. S. Ageyev, I. B. Andreyeva, V. I. Volovov, Yu. Yu. Zhitkovskiy, S. D. Chuprov, and R. F. Shvachko *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 17-26 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 57-63 (For availability see N75-17725 09-42)

The effects of subsurface waves on the propagation of sound in the ocean, the conditions which cause them, and forecasting their occurrence are discussed. A.L.

N75-17728 Joint Publications Research Service, Arlington, Va.
RANDOM NONUNIFORMITIES OF THE OCEAN SERIES c48
N. S. Ageyev, I. B. Andreyeva, V. I. Volovov, Yu. Yu. Zhitkovskiy, S. D. Chuprov, and R. F. Shvachko *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 27-39 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 63-73 (For availability see N75-17725 09-42)

The refraction of the sound caused by the regular field of the index of the fraction explains such acoustic phenomena as the shadow zone, the waveguide propagation in the submarine sound channel, the zones of convergence, the variation in direction of the wave front in the horizontal plane, etc. The random field is caused by turbulent processes in the body of the ocean and statistical methods are applicable to its description. It causes scattering of sound leading to the occurrence of a random sound field which is superposed on the regular sound field and implies sound fluctuations. The fluctuations of the index of refraction are caused basically by temperature fluctuations. Salinity fluctuations have a significantly smaller value. The scattering on the fluctuations of density and current speed in the ocean is also an order less than the scattering on the temperature inhomogeneities. Author

N75-17729 Joint Publications Research Service, Arlington, Va.
UNDERWATER SOUND CHANNEL c48
L. M. Brekhovskikh *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 40-71 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 127-154 (For availability see N75-17725 09-42)

Some of the peculiarities of propagation in an underwater acoustic waveguide, the so-called underwater sound channel, are discussed. Author

N75-17730 Joint Publications Research Service, Arlington, Va.
ANTIWAVEGUIDE PROPAGATION c71
L. M. Brekhovskikh *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 72-81 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 154-161 (For availability see N75-17725 09-42)

In contrast to waveguide propagation, the so called antiwaveguide propagation of sound where the beams originating at the source never again return to the source horizon. The theory of antiwaveguide propagation used for a broad class of cases where dc/dz at the boundary is nonzero is discussed. In this case the geometric shadow zone is formed where the beams do not penetrate, and the problem of the theory is to describe the field in the shadow zone. Another case of antiwaveguide propagation which is different with respect to its nature occurs when at the boundary $dc/dz = 0$. Here there are no points where the beams could penetrate, but with sufficiently great removal from the radiator (but not from the boundary) it is possible to get into the zone of very weak illumination where beam acoustics is inapplicable. This is the so called effective shadow zone. Author

N75-17731 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDIES OF THE SOUND FIELD IN THE OCEAN c48
N. S. Ageyeva *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 82-91 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 202-209 (For availability see N75-17725 09-42)

Analysis of the results of measuring the sound field of a concentrated source in the ocean reduces in the final analysis to the problem of determining the mean and statistical characteristics of the sound field. Only the mean value of one of the characteristics of the sound field, its intensity which makes it possible to judge the propagation anomaly, the reflection of coefficient from the ocean boundaries and the spatial damping coefficient was considered. Author

N75-17732 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL CHARACTERISTICS OF THE SOUND FIELD c48
N. S. Ageyeva *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 92-112 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 210-227 (For availability see N75-17725 09-42)

An attempt is made to try to demonstrate the expediency of the calculation apparatus based on beam theory, for analysis of the results of measuring the sound field created by the concentrated sources in the deep sea. The experimental data on

the laws of variation of the sound pressure levels with distancing, comparison of the results of the experiments with the calculation, and also the results of measuring the damping coefficients are presented. On the basis of an analysis of the experimental data, examples of determining the characteristics of the sound field are presented. Author

N75-17733 Joint Publications Research Service, Arlington, Va.
FLUCTUATIONS OF THE SIGNAL REFLECTED BY THE WAVE OCEAN SURFACE c71
S. D. Chuprov *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 118-150 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 334-360 (For availability see N75-17725 09-42)

Results of experimental observations agree well with calculated data. Studies were made of the amplitude fluctuations and sometimes the phases of the tonal signals with frequencies of 107, 270, 750, and 1500 hertz at distances of several kilometers for the radiator and receivers rigidly attached near the bottom at depths of 0.3-1.4 km. The basic frequency of the 0.10-0.12 hertz fluctuations correspond to the frequency of the peak wave spectrum; the qualitative convergence of the amplitude and wave fluctuation spectra was also noted. Although the multiple reflections from the bottom and the surface obviously were significant, nevertheless these operations permit the conclusion to be drawn of closeness of the frequencies of the peaks of the amplitude and phase fluctuation spectra of the echo and the surface elevation of the ocean in the case of small fluctuations. Author

N75-17734 Joint Publications Research Service, Arlington, Va.
SOUND FIELD RE-EMITTED BY THE SURFACE IN THE MIRROR DIRECTION AND NEAR IT c71
I. B. Andreyeva *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 151-164 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 361-371 (For availability see N75-17725 09-42)

Measurements of the intensity of the acoustic field reflected and scattered by the surface of the open sea were taken from a drifting ship. The measuring technique consisted of a radiator and receiver dropped to a depth of 150-200 meters. The radiator was directional and was oriented so that the receiver was on the same line of mirror reflection corresponding to the maximum of the radiator pattern. The glancing angle of the beams at the surface was varied from 10 deg by variation of the distance from the radiator to the receiver. The measurements were performed for a sending time of 10 milliseconds on four frequencies--1, 2, 4, and 8 kilohertz. The corresponding apertures of the radiation pattern of the transmitter with respect to the 0.7 level were 60 deg, 30 deg, 15 deg, and 8 deg. The receiver was nondirectional. During the experiment the radiator was oriented by the maximum radiation pattern in turn to the receiver and to the mirror reflection point. For each glancing angle the amplitudes of several hundreds of tonal-pulse signals were recorded which arrived both along the path of mirror reflection and directly at the receiver. Author

N75-17735 Joint Publications Research Service, Arlington, Va.
METHOD OF EXPERIMENTAL STUDY OF THE BACKSCATTER SOUND BY THE OCEAN SURFACE c71
I. B. Andreyeva *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 165-177 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 371-381 (For availability see N75-17725 09-42)

For the experimental study of the scattering of sound waves in the ocean, underwater explosions used as sound sources have found broad application. Advantages of this system are: great power in a broad spectrum of the emitted frequencies, the short duration of the investigated pulse, the practical nondirectionalness, etc. In order to investigate the surface scattering in the ocean jointly with the explosion source of the sound it is convenient to use sound receivers which remain in practice nondirectional to the frequencies of several tens of kilohertz, which simplifies the decoding of the recordings and makes it more reliable. Good results can be obtained when using ceramic hydrophones. The hoist system used to lower charges, the detonation system, and the receiver are also discussed. A.L.

N75-17736 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL CHARACTERISTICS OF THE SURFACE BACKSCATTER c71
I. B. Andreyeva *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 178-191 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 382-392 (For availability see N75-17725 09-42)

Results are presented of some experiments performed in the western part of the Equatorial Atlantic during the expedition of a scientific research ship. This discussion presents the results of studies of the frequency and angular functions of the surface backscatter and to estimate the contributions of the sound scattering layers and the layer of the surface air bubbles to the total scattered field. Author

N75-17737# Joint Publications Research Service, Arlington, Va.
ACOUSTICS OF THE OCEAN, PART 2
L. M. Brekhovskikh, ed. 31 Jan. 1975 203 p refs Transl. into ENGLISH of the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 694 p
(JPRS-64008-2) Avail: NTIS HC $7.25

An examination of oceanological features which are of importance for the acoustic properties of the ocean is presented. Both theoretical and experimental research on acoustical fields in the ocean are discussed. Some of the subjects considered are: (1) the ocean floor, (2) subsurface waves, (3) random nonuniformities of the ocean, (4) elements of sound field theory in the ocean, (5) reflection and scattering of sound by the ocean surface, and (6) reflection and scattering of sound by the ocean bottom. For individual titles, see N75-17738 through N75-17748.

N75-17738 Joint Publications Research Service, Arlington, Va.
REFLECTION OF SOUND FROM THE OCEAN BOTTOM. EXPERIMENTAL PROCEDURE c71
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 201-212 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 397-407 (For availability see N75-17737 09-42)

The reflecting properties of the bottom of the ocean are examined with respect to the modulus of reflection coefficient. The methods used for determining the modulus of reflection coefficient are explained. The methods are called: (1) the comparison method, (2) the standing wave method, and (3) the multiple reflection method. Mathematical models are developed to support the theoretical considerations. Diagrams of the test conditions are provided. Author

N75-17739 Joint Publications Research Service, Arlington, Va.
STATISTICAL CHARACTERISTICS OF ECHOES c71
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 213-234 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 408-425 (For availability see N75-17737 09-42)

The experimental and theoretical amplitude distribution functions of echoes reflected from irregular surfaces are discussed. Mathematical models are developed to show the sound pressure conditions at the reception point. The factors which influence the value of the modulus of reflection coefficient are analyzed. Diagrams are provided to explain the characteristics of echoes originating from narrow radiation patterns and from broad radiation patterns. Graphs of the low frequency amplitude fluctuations of the echoes received from separate receivers are included. The effective fluctuation frequency as a function of the variation rate of the carrier frequency during movement of the receiving-transmitting system in a horizontal plane is determined. Author

N75-17740 Joint Publications Research Service, Arlington, Va.
RELATION OF THE CHARACTERISTICS OF THE ECHOES TO THE GENERAL BOTTOM RELIEF c71
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 235-253 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 425-440 (For availability see N75-17737

09-42)

The relation of the reflecting properties of the ocean bottom to the nature of the general relief is analyzed. The mean values of the effective reflection coefficient for certain parts of the Atlantic and Indian Oceans are tabulated. Mathematical models are developed to show the variations in the modulus of the reflection coefficient with changes in the angle of incidence, the ratio of densities of the bounding media, and the sound velocity ratio. The theory of the reflection of the sound from statistically uneven interface, based on the Fraunhofer zone, is developed. Author

N75-17741 Joint Publications Research Service, Arlington, Va.
FREQUENCY AND ANGULAR DEPENDENCE OF THE CHARACTERISTICS OF ECHOES c71
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 254-266 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 440-450 (For availability see N75-17737 09-42)

The standard experimental frequency functions of the effective reflection coefficient obtained in the Atlantic Ocean in the regions with severely dissected bottom topography are presented. The experimental points which are the values of the effective reflecting coefficient for normal incidence for each experiment are joined by segments of straight lines. The numbers near these segments indicate the order number of the experiment. The vertical line at a frequency of 9.6 kilohertz denotes the range of variation of the effective reflection coefficient obtained by means of an echo sounder. The extreme values of this range were defined as the maximum and minimum values averaged over the regions with the same type of severely dissected bottom topography. Author

N75-17742 Joint Publications Research Service, Arlington, Va.
SCATTERING OF SOUND BY THE OCEAN BOTTOM. RESEARCH PROCEDURE c71
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 267-275 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 451-457 (For availability see N75-17737 09-42)

Methods for measuring the scattering coefficient of sound by the ocean floor are discussed. The methods are defined as the tone-pulse method using a sonic converter and the pulse method using explosive detonations. The equipment and procedures used for conducting the tests are described. A block diagram of the electronic equipment used for receiving the signal is provided. Author

N75-17743 Joint Publications Research Service, Arlington, Va.
ANALYSIS AND PROCESSING OF EXPERIMENTAL DATA c71
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 276-287 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 458-467 (For availability see N75-17737 09-42)

Methods for conducting a numerical analysis of the scattering of sound waves by the ocean bottom are discussed. The method used is based on the determination of the coefficient of scattering of sound by use of an explosive pulse. The effects of systematic and random errors on the accuracy of the determination are analyzed. Graphs are provided to show the angular dependence of the scattering intensity under various conditions. Recordings of the envelopes of the frequency components of the signal are reproduced. Author

N75-17744 Joint Publications Research Service, Arlington, Va.
SOUND DISPERSION IN REGIONS WITH LEVELED RELIEF c71
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics in the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 288-293 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 467-472 (For availability see N75-17737 09-42)

The analysis of the scattering properties of the bottom in different parts of the ocean indicates that the characteristics of the scattering of sound by the bottom are connected with the relief situation. The characteristics of the scattered signals obtained in regions of the ocean with a very level bottom and those obtained in regions with extraordinarily dissected topography are compared. The angular and frequency characteristics of the scattering intensity are analyzed. Graphs are provided to show the theoretical angular functions of the scattering intensity obtained for a rough surface and the frequency dependence of the scattering intensity. Author

N75-17745 Joint Publications Research Service, Arlington, Va.
SCATTERING OF SOUND IN REGIONS WITH RUGGED TOPOGRAPHY c71
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 294-305 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 472-480 (For availability see N75-17737 09-42)

The angular dependence of the scattering intensity obtained in the regions of severely dissected topography is discussed. The angular and frequency functions of the scattering intensity on the northern part of the crest of the mid Atlantic ridge are plotted as an example. Other plots are presented for: (1) Arabian-Indian Ridge, (2) Som abyssal plain, and (3) Brazilian trough. Mathematical models based on Lambert's law are developed to support the theoretical considerations. Author

N75-17746 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF THE MORPHOMETRIC CHARACTERISTICS OF THE OCEAN BOTTOM AND THE EFFECTIVE REFLECTION COEFFICIENT OF THE SOUND c48
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 306-327 refs Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 480-486 (For availability see N75-17737 09-42)

The use of explosive charges to produce signals from which the morphometric characteristics of the ocean bottom may be determined is discussed. A mathematical model is developed to show the relationship between the number of pulses scattered in a definite time interval to obtain the scattering elements per unit area of the bottom. The scattered signal also has information about the other parameters of the bottom, such as the slope angle and the irregularities of the mesorelief. Mathematical models are included which show the effective reflection coefficient for various surface conditions. Author

N75-17747 Joint Publications Research Service, Arlington, Va.
SCATTERING ON RANDOM INHOMOGENEITIES AND SOUND FIELDS IN THE OCEAN c71
R. F. Shvachko *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 328-350 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 562-581 (For availability see N75-17737 09-42)

Mathematical models are developed to show the scattering of random inhomogeneities and sound fields in the ocean. The models are applied to the solution of the problem of the amplitude and phase fluctuation of the sound wave traveling through the medium with random nonuniformities of the index of the refraction in the approximation of the geometric acoustics. The basic relations are derived for the statistical characteristics of the fluctuating signal propagated in the medium. A numerical analysis of the fluctuations which occur at medium and large distances is shown. Experimental studies to determine the nature of sound fluctuations are reported. Author

N75-17748 Joint Publications Research Service, Arlington, Va.
SIGNAL FLUCTUATIONS DURING THE PROPAGATION OF SOUND IN THE OCEAN c71
S. D. Chuprov *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 351-394 refs Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 581-612 (For availability see N75-17737 09-42)

The characteristics of sound signals propagated in the ocean are reviewed with emphasis on the causes of sound scattering. The factors which influence the amplitude, phases, and frequencies of the sinusoidal sound signals are examined. The manner in which multiple reflections are generated from the bottom and surface of the ocean is discussed. The procedure for obtaining correlation of the fluctuations of multiple reflection is explained.

The spectrum of the amplitude fluctuations is analyzed for a variety of conditions. Experiments to obtain accurate data on the nature of reflected and multiple sound signals propagated through water are described. Author

N75-17748# National Communications System, Arlington, Va.
LEGAL ECONOMIC, AND ENERGY CONSIDERATIONS IN THE USE OF UNDERGROUND SPACE
H. W. Young, R. R. Wright, R. W. Swenson, A. W. Stone, and I. Hoch Sep. 1974 129 p refs
(Contract NSF C-310; Grant NSF SSH-73-07142)
(PB-236755/5; NAS/TT-74-01; NSF/RA/S-74-002) Avail: NTIS HC $5.75 CSCL 13B

The development of a policy for use of airspace, underground space, and mineral deposits is discussed. Other topics discussed include coal strip mining, legal problems and aspects of using underground space, economic trends and demand for the development of underground space, and conservation of energy. M.J.S.

N75-17750# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
MEASUREMENTS OF THE DIELECTRIC PROPERTIES OF WET SNOW USING A MICROWAVE TECHNIQUE Research Report
Bruce D. Sweeny and Samuel C. Colbeck Oct. 1974 36 p refs
(DA Proj. 4A1-61102-B-52E)
(AD-A001550; CRREL-RR-325) Avail: NTIS CSCL 08/12

An accurate method of measuring liquid water in snow covers is required to determine the properties of wet snow. The dielectric properties of wet snow must be utilized to adequately measure its liquid water content. In this study the effect of liquid water on the complex dielectric constant of natural snow is determined in the microwave frequency range. Deloor's method for calculating the dielectric constant for mixtures and the results of waveguide experiments on samples of wet snow and glass beads are used to construct a calibration curve relating the measured dielectric loss factor directly to the water content of wet snow. The results are independent of porosity, past history and chemical impurities. A relation between the effective dielectric constant and the porosity and water content is proposed and tested experimentally. The general nature of this relation is described and suggestions are made for the development of a more precise relation. It is concluded that the dielectric constant is a function of porosity and water content only. GRA

N75-17751# California Univ., Los Angeles. Atmospheric Optics and Radiation Lab.
EVALUATION OF INDEX PROPERTIES OF NATURAL FORMATIONS BY POLARIMETRIC STUDIES Final Report, 1 Aug. 1973 - 30 Jun. 1974
Nagaraja C. R. Rao Sep. 1974 51 p refs
(Contract DAAC04-74-G-0011)
(AD-A000901; ARO-11598.2-EN) Avail: NTIS CSCL 08/13

The dependence of the polarization of radiation reflected by surfaces composed of naturally occurring soils on index properties such as moisture (water) content, texture and composition of the soil sample has been examined in detail in the laboratory in selected spectral intervals over the visible and near infrared regions of the spectrum. It is found the polarization of the reflected radiation increases with increasing surface roughness and moisture content. The onset of water-material behaviour occurs at different levels of water content for different samples. Reflection of radiation is governed by the Umow law which establishes the reciprocal relationship between surface brightness and the polarization of reflected radiation. These findings will be the basis for a series of field experiments designed to evaluate the feasibility of detection and estimation of changes in the index properties--primarily the moisture content--of the underlying surface from photopolarimetry of the radiation diffusely reflected into space by the atmosphere-ground system. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N75-17752 British Library Lending Div., Boston Spa (England).
KEY TO EARTH SECRETS
I. Morokhov 26 Jun. 1974 3 p Transl. into ENGLISH from Sots. Ind. (USSR), 4 Jun. 1974
(BLL-M-23603-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The use of a high-power pulsed MHD-generator for vertical probing of the Earth's crust to depths of 30 to 40 kilometers is discussed. The characteristics of the pulsed MHD-generator are described. The MHD-generators provide information on an area up to 100 kilometers in diameter with one pulse. The application of the plasma generator for locating sources of subsurface minerals is proposed. Author

N75-17753 British Library Lending Div., Boston Spa (England).
NATURE AND MAN IN CONDITIONS OF SCIENTIFIC AND TECHNICAL PROGRESS
G. Aksenenok 1974 13 p Transl. into ENGLISH from Vop. Filosofii (USSR), no. 10, 1973
(BLL-M-23317-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

New demands are outlined that face the U.S.S.R. system of administrative and legal regulations for environmental control to prevent air and water pollution by increasing industrial demands. Considered are pollution of air and water basins by soil errosion, by damage inflicted on the animal and vegetative sector, by unefficient rational utilization of land, oil, gas, coal, metal ores and other natural resources. G.G.

N75-17754*# Geological Survey, Reston, Va.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report
Robert Alexander, Principal Investigator, Robert W. Pease, and Harry F. Lins, Jr. 22 Jan. 1975 7 p EREP
(NASA Order T-5290-B)
(E75-10138; NASA-CR-142104) Avail: NTIS HC $3.25 CSCL 08B

The author has identified the following significant results. Successful tentative calibration permits computer programs to be written to convert Skylab thermal tapes into line-printed graymaps showing actual surface radiation temperature distributions at the time of imaging. The calibrations will be further checked when atmospheric soundings are available. Success of Skylab calibration suggests that satellite are feasible platforms for thermal scanning and provide a much broader geographical field of view than is possible with airborne platforms.

N75-17755*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN Quarterly Progress Report, Sep. - Nov. 1973
George J. McMurtry, Principal Investigator Dec. 1973 4 p EREP
(Contract NAS9-13406)
(E75-10139; NASA-CR-142105) Avail: NTIS HC $3.25 CSCL 08H

There are no author-identified significant results in this report.

N75-17756*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN Monthly Report, Jan. 1975
LeRoy F. Silva, Principal Investigator Jan. 1975 3 p EREP
(Contract NAS9-13301)
(E75-10140; NASA-CR-142106) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results.

The analysis of the SI/4 S192 data over Ft. Wayne, Indiana, taken on January 25, 1974 indicates that the thermal resolution of the thermal band in the X-5 detector array is of sufficient quality to distinguish factories, school houses, commercial buildings, and groups of residential houses from the cooler background surroundings. It is speculated that the higher thermal energy being radiated from these manmade buildings is due to a combination of the heat loss of the buildings and to the high solar absorption by the black tar roofs.

N75-17757*# Rockwell International Science Center, Thousand Oaks, Calif. Science Center.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM SKYLAB IMAGERY Monthly Report, 1 Jan. - 31 Jan. 1975
Monem Abdel-Gawad, Principal Investigator 26 Feb. 1975 2 p EREP
(Contract NAS9-14440)
(E75-10141; NASA-CR-142142) Avail: NTIS HC $3.25 CSCL 08E

The author has identified the following significant results. Two alternate models for the extension of the Texas zone through the Mojave Desert block have been developed: (1) along the Pisgah Line, and (2) along the eastern Transverse Ranges; this model suggests a counterclockwise rotation of the Mojave block. Analysis of S190B photographs of the western Mojave Desert provides strong evidence for the feasibility of identifying recent fault breaks.

N75-17758*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report
Roger M. Hoffer, Principal Investigator Jan. 1975 3 p EREP
(Contract NAS9-13380)
(E75-10142; NASA-CR-142143) Avail: NTIS HC $3.25 CSCL 08F

There are no author-identified significant results in this report.

N75-17759*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report
George A. Maul, Principal Investigator Jan. 1975 2 p EREP
(NASA Order T-4713-B)
(E75-10143; NASA-CR-142144) Avail: NTIS HC $3.25 CSCL 08C

There are no author-identified significant results in this report.

N75-17760*# California Earth Science Corp., Santa Monica.
INVESTIGATION OF LINEAMENTS ON SKYLAB AND ERTS IMAGES OF PENINSULAR RANGES, SOUTHWESTERN CALIFORNIA
P. M. Merifield, Principal Investigator and D. L. Lamar Dec. 1974 18 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contracts NAS2-7698; DI-14-08-0001-13911)
(E75-10144; NASA-CR-142145; TR-74-5) Avail: NTIS HC $3.25 CSCL 08E

The author has identified the following significant results. Northwest trending faults such as the Elsinore and San Jacinto are prominently displayed on Skylab and ERTS images of the Peninsular Ranges, southern California. Northeast, north-south, and west-north-west trending lineaments and faults are also apparent on satellite imagery. Several of the lineaments represent previously unmapped faults. Other lineaments are due to erosion along foliation directions and sharp bends in basement rock contacts rather than faulting. The northeast trending Thing Valley fault appears to be offset by the south branch of the Elsinore fault near Agua Caliente Hot Springs. Larger horizontal displacement along the Elsinore fault further northwest may be distributed along several faults which branch from the Elsinore fault in the Peninsular Ranges. The northeast and west-northwest trending faults are truncated by the major northwest trending faults and appear to be restricted to basement terrane. Limited data on displacement direction suggests that the northeast and west-northwest trending faults formed in response to an earlier period of east-northeast, west-southwest crustal shortening. Such a stress system is consistent with the plate tectonic model of a subduction zone parallel to the continental margin suggested in the late Mesozoic and early Tertiary.

N75-17761*# Natural Resources Management Corp., Eureka, Calif.
APPLICATION OF ERTS-1 IMAGERY AND UNDERFLIGHT PHOTOGRAPHY IN THE DETECTION AND MONITORING OF FOREST INSECT INFECTIONS IN THE SIERRA NEVADA MOUNTAINS OF CALIFORNIA Final Report, 21 Jun. 1972 - 31 May 1974
Ralph C. Hall, Principal Investigator, Stephen L. Wert (Earth Satellite Corp., Berkeley, Calif.), and Thomas W. Koerber (Pacific Southwest Forest and Range Experiment Station) 31 May 1974 53 p Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57298 ERTS
(Contract NAS5-21770)
(E75-10145; NASA-CR-143676; NRM-3) Avail: NTIS HC $4.25 CSCL 02F

The author has identified the following significant results. Analysis of ERTS-1 imagery with underflight aerial photo support including U-2, in the Sierra Nevada Mountains of California, indicates promising possibilities of detecting and monitoring forest insect outbreaks visually with some mechanical support utilizing the VP-8 image analyzer. Visually, it is possible at a scale of 1:1,000,000 to discriminate between large areas of damaged and undamaged forests; timbered and non-timbered areas; pasture land and cultivated fields; desert and riparian vegetation. At a scale of 1:80,000 it is possible to distinguish among three classes of tree mortality; defoliated and undefoliated areas; non-host mixed conifers; and mountain meadows, rock domes, lakes and glaciers. Machine tests showed significant differences in image densities among various bands and mortality areas.

N75-17762*# Science Applications, Inc., Ann Arbor, Mich.
USE OF SKYLAB EREP DATA IN A SEA SURFACE TEMPERATURE EXPERIMENT Interim Report
David C. Anding, Principal Investigator and John P. Walker Mar. 1975 19 p EREP
(Contract NAS9-13277)
(E75-10146; NASA-CR-142147; JRB-75-201-AA) Avail: NTIS HC $3.25 CSCL 08J

There are no author-identified significant results in this report.

N75-17763*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
EVALUATION OF ERTS-1 DATA FOR INVENTORY OF FOREST AND RANGELAND AND DETECTION OF FOREST STRESS Final Report
Robert C. Heller, Principal Investigator, Robert C. Aldrich, Richard S. Driscoll, Richard E. Francis, and Frederick P. Weber 9 Aug. 1974 276 p refs Prepared in cooperation with Rocky Mountain Forest and Range Experiment Station Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70251-AG)
(E75-10147; NASA-CR-142148; FS-3) Avail: NTIS HC $8.75 CSCL 02F

The author has identified the following significant results. Results of photointerpretation indicated that ERTS is a good classifier of forest and nonforest lands (90 to 95 percent accurate). Photointerpreters could make this separation as accurately as signature analysis of the computer compatible tapes. Further breakdowns of cover types at each site could not be accurately classified by interpreters (60 percent) or computer analysts (74 percent). Exceptions were water, wet meadow, and coniferous stands. At no time could the large bark beetle infestations (many over 300 meters in size) be detected on ERTS images. The ERTS wavebands are too broad to distinguish the yellow,

yellow-red, and red colors of the dying pine foliage from healthy green-yellow foliage. Forest disturbances could be detected on ERTS color composites about 90 percent of the time when compared with six-year-old photo index mosaics. ERTS enlargements (1:125,000 scale, preferably color prints) would be useful to forest managers of large ownerships over 5,000 hectares (12,500 acres) for broad area planning. Black-and-white enlargements can be used effectively as aerial navigation aids for precision aerial photography where maps are old or not available.

N75-17764*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Jan. 1972
Paul M. Merifield, Principal Investigator 5 Feb. 1975 2 p EREP
(Contract NAS2-7698)
(E75-10148; NASA-CR-142149; MPR-20) Avail: NTIS HC $3.25 CSCL 08G

There are no author-identified significant results in this report.

N75-17765*# Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. per la Geofisica della Litosfera.
PALEO RIVER BEDS DETECTION BY MEANS OF MULTISPECTRAL IMAGES TAKEN FROM SKYLAB Progress Report
R. Cassinis and G. M. Lechi, Principal Investigators 6 Dec. 1974 7 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(E75-10149; NASA-CR-142186; PR-4) Avail: NTIS HC $3.25 CSCL 08H

There are no author-identified significant results in this report.

N75-17766*# International Business Machines Corp., Huntsville, Ala. Federal Systems Div.
IMPLEMENTATION OF HYDROLOGIC MODELS AT GODDARD SPACE FLIGHT CENTER Final Report
31 Dec. 1974 10 p
(Contract NAS5-20597)
(NASA-CR-143684; IBM-74W-00323) Avail: NTIS HC $3.25 CSCL 08H

Major watershed simulation models were implemented on the computer system at NASA Goddard Space Flight Center, and their operation was verified. Historical and physiographic data were acquired for two Maryland river basins (Monocasy River above Jug Bridge and Patuxent River near Laurel, Maryland) and the models were calibrated to simulate them. GSFC personnel were instructed in model operation after the models were implemented. Author

N75-17767*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXTRACTION AND UTILIZATION OF SPACE ACQUIRED PHYSIOGRAPHIC DATA FOR WATER RESOURCES DEVELOPMENT
A. Rango, J. Foster (Maryland Univ., College Park), and V. V. Salomonson Jan. 1975 31 p refs Submitted for publication (NASA-TM-X-70827; X-913-75-3) Avail: NTIS HC $3.75 CSCL 08H

ERTS-1 satellite imagery was evaluated as a means of providing useful watershed physiography information. From these data physiographic parameters such as drainage basin area and shape, drainage density, stream length and sinuosity, and the percentage of a watershed occupied by major land use types were obtained in three study areas. The study areas were: (1) Southwestern Wisconsin; (2) Eastern Colorado, and (3) portions of the Middle Atlantic States. Using ERTS-1 imagery at 1:250,000 and 1:100,000 scales it was found that drainage basin area and shape and stream sinuosity were comparable (within 10%) in all study areas to physiographic measurements derived from conventional topographic maps at the same scales. Author

N75-17768*# Smithsonian Institution, Washington, D.C.
CLASSIFICATION OF WETLANDS VEGETATION USING SMALL SCALE COLOR INFRARED IMAGERY Annual Report, 9 Oct. 1973 - 20 Dec. 1974
Francis S. L. Williamson Feb. 1975 27 p refs
(Contract NAS6-1913)
(NASA-CR-62091) Avail: NTIS HC $3.75 CSCL 08A

A classification system for Chesapeake Bay wetlands was derived from the correlation of film density classes and actual vegetation classes. The data processing programs used were developed by the Laboratory for the Applications of Remote Sensing. These programs were tested for their value in classifying natural vegetation, using digitized data from small scale aerial photography. Existing imagery and the vegetation map of Farm Creek Marsh were used to determine the optimal number of classes, and to aid in determining if the computer maps were a believable product. M.J.S.

N75-17769# Louisiana State Univ., Baton Rouge.
THE TEN NATURAL VEGETATION REGIONS OF LOUISIANA: AN INTERPRETATION UTILIZING IMAGERY FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE
W. Anthony Blanchard 1973 13 p refs
Avail: NTIS HC $3.25

Natural vegetation regions of Louisiana are identified through the use of black and white imagery from the Multispectral Scanners (MSS) of the Earth Resources Technology Satellite (ERTS). Differences in the amount of infrared reflection from the vegetation and the comparison during two seasons, winter and summer, made possible interpretations of the different local plant regimes. Details of the conditions enabling the interpretation of each natural vegetation region are explained. Author

N75-17770# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY OF MARSH BUGGY TRACKS
Charles A. Whitehurst and Linda N. Doiron 1973 13 p refs Original contains color illustrations
Avail: NTIS HC $3.25

Temporary and permanent damage of marshland environments due to the use of marsh buggies in the Louisiana coastal zone was investigated. The two kinds of buggies used, tracked and wheeled vehicles, create similar effects by compacting the marsh sediments and vegetation. It was found that the degree of compacting and subsidence due to loads is dependent on the marsh type, especially the moisture content of the marsh. Color infrared imagery was used to determine the location of the buggy routes and to quantify the extent of tracks in a selected area where the marsh is seriously dissected. The imagery was also used to show successive stages of destruction. Author

N75-17771# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
A COMPARISON OF HIGH- AND LOW-ALTITUDE AERIAL INFRARED COLOR PHOTOGRAPHY FOR REMOTE SENSING OF LOUISIANA COASTAL MARSHLANDS
Charles A. Whitehurst and Judith A. Monte 1974 12 p refs Original contains color illustrations
Avail: NTIS HC $3.25

Infrared color positive transparencies (contact duplicates) were used to compare high- and low-altitude aerial color photography of the Louisiana marshlands. All the interpretation was visual, with differences such as year and season being taken into consideration. The results of the comparisons were tabulated to show the usefulness of each scale for the delineation and identification of certain natural, coastal, and man-made features. M.J.S.

N75-17772*# Alabama Univ., University.
WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY. PART 2: NON-CONSERVATIVE SPECIES TRANSPORT MODELS Interim Report
Gary C. April and Hua-An Liu Jan. 1975 205 p refs
(Contract NAS8-29100)
(NASA-CR-120821; BER-185-112-Pt-2) Avail: NTIS HC $7.25 CSCL 08H

Total coliform group bacteria were selected to expand the

mathematical modeling capabilities of the hydrodynamic and salinity models to understand their relationship to commercial fishing ventures within bay waters and to gain a clear insight into the effect that rivers draining into the bay have on water quality conditions. Parametric observations revealed that temperature factors and river flow rate have a pronounced effect on the concentration profiles, while wind conditions showed only slight effects. An examination of coliform group loading concentrations at constant river flow rates and temperature shows these loading changes have an appreciable influence on total coliform distribution within Mobile Bay. S.S.C.

N75-17773# Sandia Labs., Albuquerque, N.Mex.
RANGE-SCAN RADAR IMAGES AND THEIR APPLICATION TO MAP-MATCHING ESTIMATION OF LOCATION
L. T. James and E. A. Aronson Sep. 1974 17 p refs
(Contract AT(29-1)-789)
(SAND-74-0153) Avail: NTIS HC $3.25

The results are reported of experiments that demonstrate that a pulse radar sensor with a nondirectional antenna pattern produces images containing enough character to serve as signatures of the sensor's location when operating over the types of scenes considered. This property is a necessary condition if this type of sensor is to be employed in the design of a map matching location estimation system for use in improving the navigation accuracy of airborne inertial navigation systems.
Author (NSA)

N75-17774# Waterloopkundig Laboratorium, Delft (Netherlands).
MODEL-PROTOTYPE COMPARISONS FOR TRANSVERSE MIXING IN RIVERS
E. R. Holley (Ill. Univ., Urbana) and M. Karelse Mar. 1974 14 p refs Presented at the 15th IAHR Congr., Istanbul, 2-7 Sep. 1974
(Publ-116) Avail: NTIS HC $3.25

The transverse mixing downstream from an outfall discharging at a steady rate into a river is studied. Analytical considerations are reviewed relative to the model reproduction of the mixing process. An undistorted model can correctly reproduce the transverse diffusion in the prototype, but the diffusion in a distorted model will be too great relative to the prototype. Comparison of model and prototype concentration measurements are presented for an undistorted model of one river and for a distorted model for another river. These data comparisons substantiate the previous statements about the reproduction of diffusion. If diffusion is a significant mechanism in the process to be studied, a distorted hydraulic model should not be used. Author (ESRO)

N75-17775# Waterloopkundig Laboratorium, Delft (Netherlands).
TRANSVERSE MIXING IN RIVERS: A NUMERICAL APPROACH
G. K. Verboom Mar. 1974 16 p refs Presented at the 15th IAHR Cong., Istanbul, 2-7 Sep. 1973
(Publ-117) Avail: NTIS HC $3.25

To study the transverse mixing in rivers numerically the conservation equation of the released material was solved. A finite difference scheme that has a small numerical diffusion and dispersion is the fourth order scheme of Fromm. Some preliminary computations was made to study the accuracy of the results, and the concentration was calculated for a conservative, nonbuoyant material released into a model of a river. From concentration measurements in this model and the other characteristic features of the stream, the transverse dispersion coefficient was calculated with the general change of momentum method. This coefficient was used to find the concentration distribution. The agreement is quite satisfactory, giving support to the numerical method as well to the method by which the dispersion coefficient was found. Author (ESRO)

N75-17776# Waterloopkundig Laboratorium, Delft (Netherlands).
EXPERIENCES WITH TIDAL SALINITY MODEL EUROPOORT
A. J. VanRees, P. VanderKuur, and H. J. Stroband (Delta Works, The Hague) Jun. 1974 23 p refs Presented at the 13th Intern. Conf. on Coastal Eng., Vancouver, Can., 10-14 Jul. 1972
(Publ-125) Avail: NTIS HC $3.25

A tidal salinity model was constructed to guide the works for the new harbor entrance at Rotterdam-Europoort. The model includes a part of the North Sea and the Rotterdam waterway estuary. For its regular adjustment, use could be made of extensive prototype measurements, two-dimensional tidal computations and other tidal computations. The model has proved to be very valuable for predicting stream patterns for nautical purposes. The model has also been used for the solution of harbor problems (design, siltation), for predicting cooling water recirculation, and for advice on salinity intrusion problems. Author (ESRO)

N75-17777# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
AIRBORNE RESISTIVITY MAPPING OF PERMAFROST NEAR FAIRBANKS, ALASKA
P. Hoekstra, P. V. Sellmann, and A. J. Delaney Sep. 1974 52 p refs
(DA Proj. 4A1-62121-A-894)
(AD-A000694; CRREL-RR-324) Avail: NTIS CSCL 08/12

Airborne resistivity methods using radio waves in three frequency bands were tested in the vicinity of Fairbanks, Alaska. The test sites were selected because much ground control is available for this area. The objectives of this study were to determine the ability of these methods to map permafrost and other soils and to investigate the advantages of multifrequency mapping. The airborne resistivity data obtained in this study were contoured and the contour maps were compared with surficial geological maps and other ground truth data available. The following conclusions were reached: (1) in areas where the near-surface sediments are relatively uniform, VLF resistivity best delineates permafrost; and (2) in areas where surface sediments vary widely (e.g., recent flood plains), resistivity at all frequencies gives little information on permafrost conditions, but provides other important information, such as bedrock type, depth to bedrock, soil type and layering. (Modified author abstract) GRA

N75-17778# California Univ., Los Angeles. Dept. of Geography.
REMOTE SENSING OF SUBTROPICAL COASTAL ENVIRONMENTS: NATAL, SOUTH AFRICA
Antony R. Orme and Larry L. Loeher Jul. 1974 95 p refs
(Contract N00014-69-A-0200-4035; NR Proj. 388-102)
(AD-A000280; TR-3) Avail: NTIS CSCL 08/6

Remote sensing of subtropical coastal environments is examined with particular reference to Natal, South Africa. Vertical color infrared (CIR) imagery at a scale of 1:25,000 with 60% forward overlap forms the basis for analysis, supported by similar panchromatic coverage and hand-held oblique panchromatic and CIR imagery. The CIR imagery used in this study contributes significantly to the understanding of the physical, biological, and human components of the Natal coastal environment and, by extension, to environemntal analysis of 2000 km of similar coastline from central Mozambique to eastern Cape Province. (Modified author abstract) GRA

N75-17779# Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
FLOOD HYDROGRAPH SYNTHESIS FOR RURAL PENNSYLVANIA WATERSHEDS
Bae Ho. Lee, Brian M. Reich, Thomas M. Rachford, and Gert Aron Jun. 1974 101 p refs
(Contract DI-14-31-0001-3635)
(PB-236937/9; W75-00557; OWRT-B-041-PA(4)) Avail: NTIS HC $5.25 CSCL 08H

A method is presented for developing design hydrographs for ungaged rural watersheds ranging in size from 3 through 173 square miles. It uses the peak predicted by regional flood frequency as a starting point. Newly developed design storms for Pennsylvania and environs are employed to obtain a sequence of rainfall excesses. A theoretically derived rainfall-runoff relationship replaces the classical Soil Conservation Service 'P-Q' relationship, or uniform loss-rate approach. The synthetic unit hydrograph is modeled by a high quick-flow triangle superimposed on a flatter longer triangle of delayed flow. The rise time of the latter equals the base length of the former. Combined, these produce the double triangular unit hydrograph with four parameters specifying its shape. Each of these can be predicted from watershed and storm variables. GRA

N75-17780# Geological Survey, Denver, Colo. Water Resources Div.
EMPIRICAL DATA ON LONGITUDINAL DISPERSION IN RIVERS Final Report
Carl F. Nordin, Jr. and George V. Sabol Aug. 1974 341 p refs
(PB-236766/2; USGS-WRI-74-20; USGS-WRD-74-035) Avail: NTIS HC $9.50 CSCL 08H

Empirical data on longitudinal dispersion processes in rivers are compiled from published and unpublished sources. Fifty-one sets of data, covering flows from about 30 to 241,000 cubic feet per second (0.85 to 6,820 cubic meters per second), are analyzed graphically. For two cases, the empirical data agree very well with the one-dimensional Fickian-type diffusion theory, and four other cases agree approximately. GRA

N75-17781# Wyoming Univ., Laramie. Water Resources Research Inst.
LOW REYNOLDS NUMBER SUBLIMINATION OF BLOWN SNOW
John E. Nydahl and Kynric M. Pell 1974 42 p refs
(PB-237513/7; W75-01337; OWRT-A-013-WYO(1)) Avail: NTIS HC $3.75 CSCL 08L

The use of artificial snow control devices to induce drifting on windswept watersheds or at reclamation sites as an important consideration in snow pack management is discussed. One critical factor in determining the capacity of such a system is the transport distance of the snow particles. It was found that the transport distance of blow snow is difficult to measure in the field and is a strong function of the terrain and local environment. It is desirable to formulate sublimation models to predict idealized transport distances and to study the influence that various environmental variables have on this distance. GRA

N75-17782# Rome Air Development Center, Griffiss AFB, N.Y.
AN EVOLUTIONARY APPROACH FOR IMPLEMENTING A LARGE MULTI-USER TERRAIN DATA BASE THROUGH AN INTERACTIVE SYSTEM FOR TERRAIN PERSPECTIVE SIMULATION IN-STEPS PROGRAM
Gerald T. Capraro and Stanford T. Hovey Aug. 1974 74 p refs
(AD-A000045; RADC-TR-74-234) Avail: NTIS CSCL 08/2

The primary motivation of the study described herein was to provide digitized terrain data to be used in support of Electromagnetic Compatibility (EMC) related problems. Present day data bases are not convenient for the Rome Air Development Center's (RADC) electromagnetic prediction and modelling needs for the design and study of present and future weapon and support systems. Rather than design a system strictly for EMC needs, as has been done in the past in many areas, this technical report describes an approach for developing a multi-user digital terrain data base by using existing governmental computer aids. (Modified author abstract) GRA

N75-18160 Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS CONCERNING CORROSION CONTROL IN ROMANIAN OIL FIELDS
Al. Constantinescu, P. Constantinescu, and Ioana Borangic *In its* Transl. on Eastern Europe: Sci. Affairs, No. 448 (JPRS-63799) 3 Jan. 1975 p 7-12 refs Transl. into ENGLISH from Mine, Petrol Si Gaze (Bucharest), no. 7, Jul. 1974 p 341-343 (For availability see N75-18158 09-99)

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N75-17783# Resources for the Future, Inc., Washington, D.C.
US ENERGY R AND D POLICY: THE ROLE OF ECONOMICS
John E. Tilton Sep. 1974 138 p refs
(Grant NSF ATA-73-07742-A02)
(RFF-Working-Paper-EN-4) Avail: NTIS HC $5.75

Issues concerning the government funding of energy research and development are investigated from an economic perspective. The evolution of present-day energy R and D funding is described, and economic reasons for government intervention in the R and D effort are outlined. The importance of establishment public goals and priorities in energy policy-making is stressed. Major shortcomings of government funding policies are considered, with possible alternatives given. N.E.R.

N75-17784*# Texas Southern Univ., Houston.
COLLECTION AND CONCENTRATION OF SOLAR ENERGY USING FRESNEL TYPE LENSES Final Summary Report
Ray F. Wilson 7 Feb. 1975 13 p Original contains color illustrations
(Contract NsG-9009)
(NASA-CR-142194) Avail: NTIS HC $3.25 CSCL 10A

The efficiency of collecting solar energy using a Fresnel type lens was measured for two different collectors. A flow collector utilizes the temperature difference and heat capacity in water measurements to determine the amount of absorbed energy retained from sun rays passing through the Fresnel lens. A static collector is a hollow copper box filled with vegetable heating oil for absorption of focused solar radiation. G.G.

N75-17785*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. California Inst. of Technology.
ASSESSMENT OF THE TECHNOLOGY REQUIRED TO DEVELOP PHOTOVOLTAIC POWER SYSTEM FOR LARGE SCALE NATIONAL ENERGY APPLICATIONS
Ralph Lutwack 15 Oct. 1974 45 p refs
(Contract NAS7-100; Grant NSF AG-485)
(NSF-RA/N-74-072) Avail: NTIS HC $3.75 CSCL 10A

A technical assessment of a program to develop photovoltaic power system technology for large-scale national energy applications was made by analyzing and judging the alternative candidate photovoltaic systems and development tasks. A program plan was constructed based on achieving the 10 year objective of a program to establish the practicability of large-scale terrestrial power installations using photovoltaic conversion arrays costing less than $0.50/peak W. Guidelines for the tasks of a 5 year program were derived from a set of 5 year objectives deduced from the 10 year objective. This report indicates the need for an early emphasis on the development of the single-crystal Si photovoltaic system for commercial utilization; a production goal of 5 x 10 to the 8th power peak W/year of $0.50 cells was projected for the year 1985. The developments of other photovoltaic conversion systems were assigned to longer range development roles. The status of the technology developments and the applicability of solar arrays in particular power installations, ranging from houses to central power plants, was scheduled to be verified in a series of demonstration projects. The budget recommended for the first 5 year phase of the program is $268.5M. Author

N75-17786*# Kanner (Leo) Associates, Redwood City, Calif.
WIND POWER MACHINES
U. Hutter Washington NASA Feb. 1975 26 p refs Transl. into ENGLISH from the book "Huette, des Ingenieurs Taschenbuch" Berlin, Wilhelm Ernst and Son, 1954 p 1030-1044
(Contract NASw-2481)
(NASA-TT-F-16195) Avail: NTIS HC $3.75 CSCL 10A

Basic aerodynamic features of wind power and wind wheels are discussed. The adaptation of wind power to running machinery is described. Developments in wind power are illustrated, followed by a brief outline of operating properties. Author

N75-17787*# Kanner (Leo) Associates, Redwood City, Calif.
SOLAR ENERGY
G. Ya. Umarov and A. A. Yershov Washington NASA Feb. 1975 51 p refs Transl. into ENGLISH of the book "Solnechnaya Energetika" Moscow, Znaniye Press, no. 1, 1974 p 1-64

(Contract NASw-2481)
(NASA-TT-F-16155) Avail: NTIS HC $4.25 CSCL 10A

Water pumps, solar power stations, air conditioners, fresh-water stills, solar homes, solar cookers, fruit driers, devices for (low temperature) steaming of reinforced concrete members, solar refrigerators, solar hothouses, welding and melting of metals presents a far from complete list of the devices and areas of the possible broad use of solar energy. The first plant of solar equipment is to be built in the Uzbek city of Bukhara for production of several of these products. Author

N75-17788*# Naval Ammunition Depot, Crane, Ind. Weapons Quality Engineering Center.
EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS. INITIAL EVALUATION TESTS OF GULTON INDUSTRIES, INCORPORATED 6.0 AMPERE-HOUR NICKEL-CADMIUM SPACECRAFT CELLS FOR THE SAN MARCO SPACECRAFT
J. D. Harkness 3 Jan. 1975 19 p
(NASA Order S-23404-6)
(NASA-CR-141232; WQEC/C-75-1) Avail: NTIS CSCL 10A

A test program was conducted to insure that all cells put into the life cycle program are of high quality. Test limits specified those values in which a cell is to be terminated from a particular charge or discharge. The five cells with the higher amount of electrolyte normally exhibited higher end-of-charge voltages and pressures during tests. It is recommended that manufacturing processes and controls should be such that they prevent swelling of the plate stack, thereby preventing cell case distortion. Author

N75-17789*# Naval Ammunition Depot, Crane, Ind. Weapons Quality Engineering Center.
EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS: INITIAL EVALUATION TESTS OF EAGLE-PICHER INDUSTRIES, INCORPORATED 6.0 AMPERE-HOUR, NICKEL-CADMIUM SPACECRAFT CELLS FOR SEPARATOR MATERIAL EVALUATION
J. D. Harkness 17 Jan. 1975 21 p
(NASA Order S-23404-G)
(NASA-CR-141231; WQEC/C-75-32) Avail: NTIS HC $3.25 CSCL 10A

Several groups of nickel cadmium cells were tested for the durability of their separator materials. The cells were rated at 6.0 ampere-hours, and contained double ceramic seals. Two cells in each group were fitted with pressure gauge assemblies. Results are presented for various brands of separator materials. Author

N75-17790# Joint Publications Research Service, Arlington, Va.
FIRST JOINT SOVIET-AMERICAN COLLOQUIUM ON THE PROBLEMS OF MHD ENERGY CONVERSION
3 Jan. 1975 255 p refs Transl. into ENGLISH from various Russian articles Colloq. held at Moscow, 25-27 Feb. 1974
(JPRS-63794) Avail: NTIS HC $8.50

Physical and technical aspects of electric power generation by magnetohydrodynamic energy conversion are discussed. For individual titles, see N75-17791 through N75-17804.

N75-17791 Joint Publications Research Service, Arlington, Va.
PROSPECTS FOR MAGNETOHYDRODYNAMIC ELECTRIC POWER PLANTS IN POWER ENGINEERING
V. A. Kirillin, L. A. Melentyev, and A. Ye. Sheyndlin *In its* 1st Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 23-41 Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

A study is made of thermal circuits of the industrial magnetohydrodynamic electric power plants for various purposes-- peak, maneuverable and basic. Various operating regimes are described, and the maneuverable properties are discussed. The most characteristic values of the parameters of the investigated magnetohydrodynamic devices are presented. An estimate is made of the reduction in calculated expenditures on the production of electric power at the magnetohydrodynamic electric power plants. Author

N75-17792 Joint Publications Research Service, Arlington, Va.
SOME DEVELOPMENTS OF INDUSTRIAL MAGNETOHYDRODYNAMIC ELECTRIC POWER PLANTS
Ye. M. Shelkov, P. P. Ivanov, V. I. Kovbasyuk, G. B. Levental, G. N. Morozov, L. Kh. Parnev, S. A. Pashkov, Yu. D. Sokirko, Ye. V. Shishkov, and B. Ya. Shumyatskiy *In its* 1st Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 42-60 refs Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

The preliminary developments of two types of magnetohydrodynamic electric power plants are presented: (1) Power units with a broad operating range; and (2) semipeak magnetohydrodynamic electric power plants. The characteristics of the semipeak magnetohydrodynamic electric power plant using gas-fuel oil as fuel indicate that the optimal combination is the combination of a forced magnetohydrodynamic generator with a simplified steam turbine unit operating synchronously with respect to a load chart which is close to a stepped chart. The smooth variation of the power consumption regime in the power system is insured by joint operation of several power units in the magnetohydrodynamic power plant. Author

N75-17793 Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN THE FIRST STEP OF THE MASTERY OF THE U-25 DEVICE
A. Ye. Sheyndlin, A. V. Nedospasov, S. A. Pashkov, D. S. Linkhasik, S. I. Pishikov, V. S. Sidorov, G. P. Telegin, Ye. M. Shelkov, and B. Ya. Shumyatskiy *In its* 1st Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 61-81 Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

The U-25 device is an experimental all-purpose power unit with an open cycle magnetohydrodynamic generator. The working medium is the product of combustion of natural gas in an oxidizing agent. A brief description of the equipment control, protection and monitoring systems and the device as a whole is presented. Author

N75-17794 Joint Publications Research Service, Arlington, Va.
ELECTRONIC MODEL OF THE U-25 DEVICE
R. A. Alyautdinov, V. A. Bashkatov, Yu. S. Bondin, S. I. Pishikov, V. N. Sariyev, Ye. M. Shelkov, and E. E. Shpilrayn *In its* 1st Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 82-93 Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

The analog model is based on the mass, momentum and energy transfer equations written in quasistationary approximations considering the specific static integral characteristics of the electrothermal and hydraulic units of the device. The limits of applicability of the model and means of improving it are substantiated, and possible prospects for using the developed models in planning natural experiments, training operating personnel and when planning and designing similar devices are noted. Author

N75-17795 Joint Publications Research Service, Arlington, Va.
ENGINEERING METHOD OF CALCULATING THE FLOW IN THE CHANNEL OF A MAGNETOHYDRODYNAMIC GENERATOR
V. A. Bityurin, G. A. Lyubimov, G. I. Maslennikov, and S. A. Medin *In its* 1st Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 94-111 refs Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

The basic principles are discussed for calculating the flow in the channel of the magnetohydrodynamic generator based on the quasi one-dimensional approximation of the equations of magnetic hydrodynamics. An example is presented of the closed description of the flow in the through section of the magnetohydrodynamic generator. Author

N75-17796 Joint Publications Research Service, Arlington, Va.
QUASI-ONE-DIMENSIONAL AND ENGINEERING METHOD OF CALCULATING THE CHANNEL OF A MAGNETOHYDRODYNAMIC GENERATOR AND COMPARISON WITH EXPERIMENTAL DATA
V. A. Bashilov, P. P. Lazarev, Yu. V. Makarov, A. S. Pleshanov, and A. M. Chibisov *In its* 1st Joint Soviet-Am. Colloq. on the

Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 112-122 refs Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

The schematic is presented for calculating the quasi one-dimensional magnetohydrodynamic flow considering the difference from the derivatives of the nonuniformity coefficients. The system automatically takes into account the voltage drop near the electrodes and the transverse current leakages near the insulators. The efficiency of replacing integration over the coordinates by integration over the temperature is demonstrated. For the specific magnetohydrodynamic channel, the averaging of the specific resistance has greatest significance in the quasi one-dimensional description. Author

N75-17797 Joint Publications Research Service, Arlington, Va.
THERMODYNAMIC PROPERTIES, COMPOSITION AND PROPERTIES OF THE TRANSPORT OF THE COMBUSTION PRODUCTS OF SOLID FUEL
Ye. V. Samuylov, I. B. Rozhdestvenskiy, S. A. Tager, N. N. Tsitelauri, K. K. Olevinskiy, Ya. P. Rabiner, N. M. Kortsenshteyn, and V. N. Gutov *In its* 1st Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 123-142 refs Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

The scalar conductivity was calculated for products of combustion of various forms of fuel, and a comparative analysis is made of the calculation results. It was established that the products of combustion of coal with potassium added with relatively low specific weight of the mineral part (to 20%) have a conductivity exceeding the conductivity of the products of combustion of gas with potassium added under comparable conditions. The effect of the properties of the components of the combustion products of the fuels including potassium, the heating temperature of the oxidizing agent, the excess coefficient of the oxidizing agent and other factors on the conductivity were analyzed. In particular, the analysis of the results of calculating the conductivity of the combustion products of coal and gas with potassium added demonstrated that increased conductivity of the combustion products of coal is explained by a low water content in the dehydrated coal dust. Author

N75-17798 Joint Publications Research Service, Arlington, Va.
CRITICAL CURRENT DENSITY THROUGH THE ELECTRODES OF A MAGNETOHYDRODYNAMIC GENERATOR MADE OF CERAMICS ZrO_2-Y_2O_3, ZrO_2-CaO, AND OTHERS
Ya. P. Gokhshteyn *In its* 1st Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 143-153 refs Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

Five possible electrode materials are studied: ZrO_2(+CeO2), (LaSr)CrO_3, ZrB_2(+SiC), SiC and molybdenum. The initial thermochemical calculations and measurements show that none of these possible materials can be used as the high temperature electrode for long periods of time without monitoring the composition of the coating gas phase or the condensed slag layer. However, monitoring the composition of the additive slag in the systems operating on coal, by including protective additives in the combustion products can be useful not only on the level of reducing the solution rate of the electrode to a minimum but also on the level of regulating the most important physical properties of the slag. Author

N75-17799 Joint Publications Research Service, Arlington, Va.
IONIZING ADDITIVE IN THE U-02 AND U-25 MAGNETOHYDRODYNAMIC DEVICES
M. A. Styrikovich, I. L. Mostinskiy, M. S. Pinkhasik, Yu. A. Zakharko, and R. S. Nekhoroshev *In its* 1st Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 154-169 refs Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

A survey of the work done by the High Temperatures Institute of the U.S.S.R. Academy of Sciences on the problems of the entrance and exit of the ionizing additive in the form of K_2CO_3 is presented. The problems of dispersion, ionization, the behavior in the gas-air channel and trapping of the additive are discussed. A study is made of the basic results of the experience in operating the experimental U-02 and the experimental-industrial U-25 magnetohydrodynamic devices. Author

N75-17800 Joint Publications Research Service, Arlington, Va.
STUDY OF THE PROLONGED OPERATION OF THE INSULATING WALLS OF AN OPEN-CYCLE MAGNETOHYDRODYNAMIC GENERATOR
A. Ye. Sheyndlin, A. V. Beloglazov, D. K. Burenkov, and V. I. Zalkind *In its* 1st Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 170-183 refs Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

Insulating properties and electric strength were studied on open metal surface cold walls, and heat resistant coated hot walls for the hydrodynamic generator channel. Both of the structural designs underwent prolonged testing without significant loss in thermodynamic properties. G.G.

N75-17801 Joint Publications Research Service, Arlington, Va.
STUDY OF THE MICROARC OPERATING REGIME OF ELECTRODES IN AN OPEN-CYCLE MAGNETOHYDRODYNAMIC GENERATOR
V. I. Zalkind, N. V. Zuyeva, V. V. Kirillov, A. P. Markina, A. S. Tikhotskiy, Yu. L. Igitkhanov, Yu. I. Isayenkov, A. V. Nedospasov, L. P. Poberezhskiy, and M. K. Puzyrev *In its* Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 184-207 refs Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

Cathode spots and potential drop of copper and chronium alloy electrodes were studied as a function of the plasma flow around the surface, the total current on the electrode, the flux temperature and the electrode temperature in the presence of a magnetic field and without it. Experimental data demonstrated that the resistance of the electrode operating in the arc regime is determined to a significant degree by the superheated plasma in the zone of attraction of the current into the arc channel. Author

N75-17802 Joint Publications Research Service, Arlington, Va.
STUDY OF THE PROCESSES OF COLD ELECTRODES IN THE CHANNEL OF A MAGNETOHYDRODYNAMIC GENERATOR
A. V. Bagdonas, V. A. Bashilov, V. M. Gribkov, Yu. G. Makarov, E. K. Chekalin, and B. D. Flid *In its* 1st Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 208-219 refs Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

The properties of nonstationary cathode spots are studied on copper cooled electrodes placed in a supersonic flow of rarefied high conducting argon plasma created in a vacuum plasmotron. It is demonstrated that the addition of oxygen or oxygen-containing gases stimulates the formation of fast weakly luminous cathode spots, the number of which is proportional to the current. In the absence of oxygen in the plasma flux for various currents only one spot was observed, the brightness of which pulsed with high frequency, decreasing with an increase in the current. Author

N75-17803 Joint Publications Research Service, Arlington, Va.
PLASMA DIAGNOSTICS IN THE CHANNELS OF MAGNETOHYDRODYNAMIC GENERATORS
I. A. Vasilyeva, K. M. Zykova, I. M. Gaponov, L. V. Deputatova, A. P. Nefedov, V. B. Novosadov, L. P. Poberezhskiy, and L. S. Tolchinskiy *In its* 1st Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 220-232 refs Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

The basic plasma characteristics are investigated that affect the operation of the magnetohydrodynamic generator: The temperature, the concentration of atoms of the lightly ionizing admixture, and the electrical conductivity. A movie was taken of the electrode surface while recording the power. The plasma temperature is measured using an automobile device based on the generalized method of inversion of the spectral lines. The device is controlled remotely. Author

N75-17804 Joint Publications Research Service, Arlington, Va.
SPECIAL DIAGNOSTIC METHODS FOR STUDYING THE

PARAMETERS OF PROCESSES IN A MAGNETOHYDRODYNAMIC GENERATOR OPERATING ON SOLID FUEL
E. P. Zimin, E. G. Mikhnevich, V. A. Tishchenko, and E. K. Chekalin *In its* Joint Soviet-Am. Colloq. on the Probl. of MHD Energy Conversion (JPRS-63794) 3 Jan. 1975 p 233-251 refs Transl. into ENGLISH from Russian article (For availability see N75-17790 09-44)

For diagnosing the quantitative parameters of the slag film (thickness, electrical conductivity) on the walls of the channel, a study is made of the use of the induction method based on recording the variation of the Q-factor of the high frequency loop in the presence of a conducting medium. Two versions of executing this method are reported: (1) for measuring the electrical conductivity of the high-conducting slag film; and (2) for measuring the electrical conductivity of the flux and thickness of the low conducting slag film. The sounding of the slag film and the operating gas is done from the channel wall without introducing a high frequency sensor into the flux. Author

N75-17805*# Heliotek, Sylmar, Calif.
DEVELOPMENT OF PROCESSING PROCEDURES FOR ADVANCED SILICON SOLAR CELLS
J. A. Scott-Monck, P. M. Stella, and J. E. Avery Jan. 1975 61 p refs
(Contract NAS3-17350)
(NASA-CR-134740) Avail: NTIS HC $4.25 CSCL 10A

Ten ohm-cm silicon solar cells, 0.2 mm thick, were produced with short circuit current efficiencies up to thirteen percent and using a combination of recent technical advances. The cells were fabricated in conventional and wraparound contact configurations. Improvement in cell collection efficiency from both the short and long wavelengths region of the solar spectrum was obtained by coupling a shallow junction and an optically transparent antireflection coating with back surface field technology. Both boron diffusion and aluminum alloying techniques were evaluated for forming back surface field cells. The latter method is less complicated and is compatible with wraparound cell processing. Author

N75-17806# Committee on Interior and Insular Affairs (U. S. Senate).
OVERSIGHT: MANDATORY PETROLEUM ALLOCATION PROGRAMS
Washington GPO 1974 194 p refs Hearings pursuant to S. Res. 45 before Comm. on Interior and Insular Affairs, 93d Congr., 2d Sess., 15 Jan. - 28 Feb. 1974 Prepared by Federal Trade Commisson
(GPO-31-027) Avail: Comm. on Interior and Insular Affairs

Findings and conclusions are presented of a program to monitor the implementation of mandatory petroleum allocation and price regulation under the Emergency Petroleum Allocation Act. Other topics discussed include the effectiveness of the allocation program, the administration of the program, historical trends in petroleum supply and demand, and regional and state allocation programs. M.J.S.

N75-17807*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FACTORS INFLUENCE FLEXIBILITY RESISTIVITY AND ZINC DENDRITE PENETRATION RATE OF INORGANIC SEPARATORS FOR ALKALINE BATTERIES
Dean W. Sheibley Washington Mar. 1975 20 p refs
(NASA-TM-X-3199; E-8054) Avail: NTIS HC $3.25 CSCL 10C

Developmental work resulted in a formulation which can improve the flexibility of the inorganic-organic-type separator for silver-zinc and nickel-zinc alkaline batteries. The effects of various fillers and reactive organic additives on separator volume resistivity are described. The effects of various inert fillers on the zinc dendrite penetration rate of the separator are shown. Conclusions regarding the operating mechanism of the separator are presented. Author

N75-17808*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 1973 GSFC BATTERY WORKSHOP, SECOND DAY
14 Nov. 1973 162 p
(NASA-TM-X-72540) Avail: NTIS HC $6.25 CSCL 10C

Technological progress in the development, testing, and manufacturing of nickel-cadmium battery cells as well as hydrogen cells is presented. The following major topics were discussed: (1) carbonate analysis; (2) nickel-cadmium memory effect; (3) use of batteries in an automatic acquisition and control system; (4) accelerated testing; (5) formulation of a mathematical odel for a nickel-cadmium cell; (6) development of a light weight nickel-cadmium battery capable of delivering 20 watt hours per pound; (7) magnetic testing of nickel-cadmium cells; (8) design and performance characteristics of nickel-hydrogen and silver-hydrogen cells; and (9) development of a semiprismatic cell design. For Vol. 1, see N75-15152. J.M.S.

N75-17809# Argonne National Lab., Ill.
HIGH PERFORMANCE BATTERIES FOR OFF-PEAK ENERGY STORAGE Progress Report, Jan. - Jun. 1973
P. A. Nelson, W. J. Walsh, and R. K. Steunenberg Mar. 1974 60 p refs
(Contract W-31-109-ENG-38)
(ANL-8038) Avail: NTIS HC $4.25

The development to high specific energy lithium/sulfur batteries for off-peak energy storage in electric utility networks is considered. The design goals for the battery include a specific energy of 150 to 200 W-hr/kg, a specific power of 25 to 50 W/kg, and a lifetime of 5 years and more than 1250 charge-discharge cycles. The cell design selected for the initial studies has upper and lower negative electrodes of a lithium-aluminum alloy, a central positive electrode containing sulfur and additives to lower the sulfur vapor pressure, and a molten LiCl-KCl eutectic electrolyte. Initial cell tests have been directed toward development of a Li-Al alloy electrode, formed by electrochemical deposition of lithium on a porous substrate of aluminum fibers and a sulfur electrode consisting of a mixture of a sulfur-arsenic alloy and finely divided carbon. Author (NSA)

N75-17810# Sandia Labs., Albuquerque, N.Mex.
SOLAR TOTAL ENERGY PROGRAM Quarterly Report, Apr. - Jun. 1974
J. A. Leonard and S. Thunborg Sep. 1974 40 p refs
(Contract AT(29-1)-789)
(SAND-74-0208) Avail: NTIS HC $3.75

Exploratory system studies conducted in response to the need for nonpolluting sources of energy are described. An outgrowth of these studies was the concept of a cascaded solar total energy system, which utilizes the sun as the source of supply of a wide range of energy needs. System operation is described and a hardware program is developed to determine the technical and economic feasibility of a solar total energy system. Such a system offers (1) savings in fossil fuels; (2) is economically competitive with other systems; and (3) minimizes harmful effects on the environment. J.M.S.

N75-17811# Atomic Energy Commission, Oak Ridge, Tenn. Technical Information Center.
COAL PROCESSING: GASIFICATION, LIQUEFACTION, DESULFURIZATION A Bibliography, 1930-1974
Oct. 1974 763 p refs
(TID-3349) Avail: NTIS

The bibliography contains reference to 7441 publications covering the period 1930 (and earlier) to 1974. The subject areas covered are coal product carbonization, gasification, liquefaction, hydrogenation, purification, desulfurization, pyrolysis, cracking, and solvent extraction. Personal author, subject, and report number indexes are included, as well as a glossary of the more important named processes for converting and purifying coal and coal products. Author (NSA)

N75-17812# Los Alamos Scientific Lab., N.Mex.
DESIGN AND TESTING OF A STRUCTURALLY INTEGRATED STEEL SOLAR COLLECTOR UNIT BASED ON EXPANDED FLAT METAL PLATES
S. W. Moore, J. D. Baccomb, and J. C. Hedstrom 1974 35 p Presented at the Intern. Solar Energy Soc., Fort Collins, Colo., 19-23 Aug. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1093; Conf-740811-3) Avail: NTIS HC $3.75

The LASL flat plate collector design is based on combining the solar collector into a structural unit so that the collector

doubles as the building roof. It is weather tight and insulated. It is easily installed and maintained by building craftsmen. Two mild steel plates are welded and pressure expanded to form a heat transfer panel. Extensions of the plates provide a structural C-beam support on the bottom and a glazing trough on the top. Glass is added on the top and insulation on the bottom to complete the unit. The collectors are two feet wide by ten feet or longer. Factor-assembled cost predictions are $2.50 to $3.00 per square foot, based on large scale mass production. Test data taken over several months confirming the performance of the collectors are presented. Preliminary test data on electro-deposited selective surfaces are given. Materials section, design, manufacturing, and coolant fluid selection considerations are discussed. The effect of various heat leakage paths is discussed. The selection of materials and design for the glass support is discussed. Author (NSA)

N75-17813# Los Alamos Scientific Lab., N.Mex.
CONTROL SYSTEM DESIGN AND SIMULATION FOR SOLAR HEATED STRUCTURES
H. S. Murray, J. F. Hafer, J. P. Shipley, T. E. Springer, J. D. Balcomb, and J. C. Hedstrom 1974 29 p refs Presented at the Intern. Solar Energy Soc., Fort Collins, Colo., 19-23 Aug. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1085; Conf-740811-4) Avail: NTIS HC $3.75

Results are given for some methods of control of building environment using solar energy systems. The control problem differs from that of conventional heating and cooling systems in two major respects: (1) the temperature of the energy source of the system is constantly fluctuating, (2) the system performance criteria must include consideration of minimizing the energy requirements of the auxiliary heat source. The model includes a description of the dynamics of a single-glazed flat plate solar collector, energy storage system, auxiliary heating system, and the structure. A hybrid computer implementation is chosen for the model. One year of operation is simulated in 8.76 minutes. This allows an economical evaluation of an entire year of operation using various control modes and parameters. Results of simulation of a year's operation with each of the control schemes are presented, and it is shown that a suboptimal controller works quite well. Implications of each controller are discussed.
Author (NSA)

N75-17814# Los Alamos Scientific Lab., N.Mex.
ENERGY AND CRYOENGINEERING
E. F. Hammel 1974 20 p Presented at the 5th Intern. Cryog. Eng. Conf., Kyoto, 7 May 1974 Sponsored by AEC
(LA-UR-74-741; Conf-740509-8) Avail: NTIS HC $3.25

Cryoengineering technologies relating to energy sources include instrumentation, handling of LNG, and fusion reactions. Cryogenic magnetometers utilizing SQUIDS are now available, sensitive gravimeters are being developed, and bolometers may be deployed in satellites for detecting geothermal anomalies. Two major approaches are discussed in which a plasma is confined magnetically and the recent technology of inertial confinement. Superconducting technology applicable in the mid-term energy requirement is superconducting magnetic separators, large air separation plants for coal gasification, cryopumping for stack gas cleanup, and cryoresistive power transmission. NSA

N75-17815# California Univ., Livermore. Lawrence Livermore Lab.
MATERIALS SCREENING PROGRAM FOR THE LLL GEOTHERMAL PROJECT
L. E. Lorensen 9 Jan. 1974 11 p Presented at the 14th Eng. for the Mater./Energy Challenge Symp., Albuquerque, N. Mex., 28 Feb. - 1 Mar. 1974 Sponsored by AEC
(UCRL-75353; Conf-740222-2) Avail: NTIS HC $3.25

In order to assist in the development of the total flow concept for the utilization of hot geothermal brine, a materials selection and screening program has been started. Polymers and composites resistant to the high temperatures, hot brine, and erosive conditions present in a flowing well are being sought. Ultimately fabrication into pipes, turbine nozzles, and turbine blades will be required. Test specimens and test equipment are being obtained. The program outline is presented and a few limited test results reported. Author (NSA)

N75-17816# Societe des Accumulateurs Fixes et de Traction, Romainville (France). Dept. Accumulateurs Alcalins.
STUDY OF NICKEL-CADMIUM BATTERIES FOR USE IN APPLICATIONS SATELLITES, PHASE 2. MAINTENANCE OF VO 23S Ni-Cd BATTERIES [ETUDE DES ACCUMULATEURS Ni-Cd POUR UTILISATION DANS LES SATELLITES D' APPLICATION. RAPPORT NO. 5, ETUDE DU RECONDITIONNEMENT DES ACCUMULATEURS NiCd VO 23S]
S. Font Apr. 1973 26 p In FRENCH
(Contract ESTEC-1358/71-SL)
(DT/SAS-250/73-SF/JM; Rept-05; ESRO-CR(P)-327) Avail: NTIS HC $3.75

A series of work-rest, charge-discharge cycles was performed in preset conditions on Ni-CD batteries for establishing whether reconditioning treatment, i.e. very slow charging conditions after prolonged storage, would restore optimum discharge efficiency during further cycling and eventually enhance service life. Work-rest cycles during geostationary orbit service were simulated. Results indicate that reconditioning treatment does not lengthen service life of the batteries. It is concluded that operation parameters must be optimized with a view to optimum service life for a given mission. ESRO

N75-17817# Societe des Accumulateurs Fixes et de Traction, Romainville (France). Dept. Accumulateurs Alcalins.
STUDY OF NICKEL-CADMIUM BATTERIES FOR USE IN APPLICATIONS SATELLITES, PHASE 2. EVALUATION OF Ni-Cd BATTERIES VO 23 S OVERCHARGE [ETUDE DES ACCUMULATEURS Ni-Cd POUR UTILISATION DANS LES SATELLITES D'APPLICATION. RAPPORT NO. 7, EVALUATION DE LA SURCHARGE SUR ACCUMULATEURS NiCd VO 23S]
S. Font May 1973 32 p In FRENCH
(Contract ESTEC-1358/71-SL)
(DT/SAS-406/72-SP/JM; Rept-07; ESRO-CR(P)-329) Avail: NTIS HC $3.75

Overcharging characteristics of Ni-Cd batteries for use in geostationary satellites were determined at-20, 0, 20 and 40 C. Results are presented in graphic and tabular form. ESRO

N75-17818# Army Electronics Command, Fort Monmouth, N.J.
PROPOSED STANDARD FAMILY OF ac TO dc POWER SUPPLIES
William L. Dudley Sep. 1974 19 p refs
(DA Proj. 1S7-62705-AH-94)
(AD-A000658; ECOM-4258) Avail: NTIS CSCL 10/2

The report presents a Standard Family of ac to dc Power Supplies established to provide militarized units that are compatible with size and weight improvements in field type solid state communications-electronics user equipments and which supply clean, quality power demanded for safe operation of semiconductorized equipment. Availability of this standard family will prevent proliferation and reduce the number of types of power supplies in the Army supply system. Detailed technical descriptions of six power supply models comprising the standard family are given. A program for development of new power processing technology for improved power supply design to keep pace with advancements in user equipment design is described.
Author (GRA)

N75-17819# Army Foreign Science and Technology Center, Charlottesville, Va.
THERMODYNAMIC ANALYSIS AND PARAMETER OPTIMIZATION OF A SOLAR THERMOELECTRIC POWER UNIT WITH RADIATION HEAT DISSIPATION
L. M. Drabkin 6 Mar. 1974 16 p refs Transl. into ENGLISH from Geliotekhnika (USSR), no. 3, 1972 p 15-23
(AD-A000211; FSTC-HT-23-1592-73) Avail: NTIS CSCL 10/2

The methodology for optimizing the calculation of parameters of a thermoelectric battery obtaining heat at a constant junction temperature and emitting it into the surrounding space by means of radiation at a uniform temperature is examined. An equation for the efficiency factor for the maximum power routine is derived from a formula of A.F. Ioffe. The methodology is applied to an example, and 27 parameters are calculated. GRA

N75-17820# Army Foreign Science and Technology Center, Charlottesville, Va.
PROCESSES DURING STORAGE OF CHARGED SILVER-CADMIUM (Ag-Cd) BATTERIES
E. N. Molotkova and N. B. Lipunova 11 Jan. 1974 14 p refs Transl. into ENGLISH from Vses. Nauchn. Issled. Akkmulisternyi Inst., sb. Rabot Khim. Istochnikam Toka (USSR), no. 6, 1971 p 108-117
(AD-A000246; FSTC-HT-23-631-74) Avail: NTIS CSCL 10/3

The paper presents data showing the change of the electrical characteristics of the electromotive force of the capacity of the discharge voltage, the phase composition of grid electrode plugs, the composition of an electrolyte, and of the hydrate-cellulose separative film during the process of long storage of charged silver-cadmium batteries at temperatures of 20-50 degrees. The question of the possible mechanism for self-charging processes is discussed. GRA

N75-17821# Carnegie-Mellon Univ., Pittsburgh, Pa.
SOLAR SEA POWER Annual Progress Report, 1 Apr. - 30 Jun. 1974
Clarence Zener, L. J. Dykstra, Robert R. Rothfus, Abrahim Lavi, Edward Krokosky, Charles Kriebel, Francis Clay McMichael, and Chin Chang Wu 31 Jul. 1974 139 p refs
(Grant NSF GI-39114)
(PB-236997/3; NSF/RANN/SE/GI-39114/PR/74/4) Avail: NTIS CSCL 10B

After a summary of prior work on design for high heat transfer and low pressure drops, design for maintenance of structural integrity at minimum cost are presented. Since pump costs are approximately proportional to the water flux which they handle, the water pump also threatens to constitute a major cost item. A study of pump designs specifically for solar sea power plants is covered along with cost estimates. GRA

N75-17822# California State Office of Science and Technology, Sacramento.
CALIFORNIA ENERGY WORKSHOP: DEVELOPING A PLAN OF ACTION TO MEET THE ENERGY CRISIS IN CALIFORNIA
Arthur B. Jebins Dec. 1973 52 p refs
(Grant NSF GI-39241)
(PB-237045/0; NSF/RA/G-73/042) Avail: NTIS HC $3.75 CSCL 10A

Supply, demand, and possible directions for an energy policy program to take are discussed. Report briefly covers offshore oil production, deep water ports, secondary and tertiary oil recovery, onshore oil and gas development, nuclear power, and geothermal power development. Also noted is the energy demand by utilities, transportation, industry, and residential and commercial buildings. GRA

N75-17823# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.
DESIGN AND CONSTRUCTION OF A RESIDENTIAL SOLAR HEATING AND COOLING SYSTEM Semiannual Progress Report, 1 Jan. - 31 Jul. 1974
George O. G. Lof Aug. 1974 233 p refs
(Grant NSF GI-40457)
(PB-237042/7; NSF/RANN/SE/GI-40457/PR/74/2; NSF/RA/N-74-104) Avail: NTIS HC $7.50 CSCL 10B

The first integrated system providing heating and cooling to a building by use of solar energy was designed and installed in a residential-type building at Colorado State University. Solar heated liquid supplies heat to air circulating in the building and to a lithium bromide absorption air conditioner. Service hot water is also provided. Approximately two-thirds of the heating and cooling loads are expected to be met by solar energy, the balance by natural gas. The report contains details of design and principles of operation. A breakdown of costs of equipment and its installation is provided. GRA

N75-17824# New York State Assembly Scientific Staff, Albany.
ECONOMIC AND ENERGY CONSERVATION RELATIONSHIP RELEVANT TO STATE OF NEW YORK BUILDING DESIGN AND CONTRACT AWARDS Final Report, Nov. 1973 - Jun. 1974
William S. Fleming Jun. 1974 97 p Prepared in cooperation with Syracuse Univ., N.Y.
(Grants NSF ISR-72-05606-A02; NSF GT-32162)
(PB-237006/2; SS-411; NSF/RA/G-74/016) Avail: NTIS HC $4.75 CSCL 13M

An economic and energy conservation analysis procedure that can be used in building design and operation is developed. A listing and analysis of the available computer programs, discussion of the technological and market development factors needed for forecasting energy requirements and consumption, and an in-depth analysis of performance specification alternatives are included. Positive and negative energy conservation technological and economic features are discussed with an itemization of factors which could be implemented. The conclusive recommendation is to require a performance specification which contains life cycle costing. Some recommendations for legislation are included. GRA

N75-17825# New York State Assembly Scientific Staff, Albany.
USE OF SOLAR ENERGY IN BUILDINGS IN NEW YORK STATE Final Report, Oct. 1973 - Apr. 1974
Clyde G. Oakley Apr. 1974 42 p refs Prepared in cooperation with Syracuse Univ., N.Y.
(Grants NSF ISR-72-05606-A02; NSF GT-32162)
(PB-236974/2; SS-405; NSF/RA/G-74/013) Avail: NTIS HC $3.75 CSCL 10B

A brief history of solar energy use in given and potential advantages and disadvantages of using solar energy are examined. An overview of solar devices is presented and two common types of solar cells and other parts of a solar electrical system are discussed. The impact increased use of solar heating and cooling and factors that have discouraged use of solar energy are discussed along with possible actions the New York State Legislature could take concerning solar energy. GRA

N75-17826# Institute for Defense Analyses, Arlington, Va. Program Analysis Div.
INTERMEDIATE-TERM ENERGY PROGRAMS TO PROTECT AGAINST CRUDE-PETROLEUM IMPORT INTERRUPTIONS: FEASIBLE ALTERNATIVES, PROGRAM COSTS, AND OPERATIONAL METHODS OF FUNDING Final Report
Robert E. Kuenne, Gerald F. Higgins, Robert J. Michaels, and Mary Summerfield Sep. 1974 139 p refs
(Contract DI-14-01-0001-2051)
(PB-237209/2; P-1063) Avail: NTIS HC $5.75 CSCL 10A

The results of a study of likely U.S. energy problems in the intermediate term (5 to 10 years in the future) and policies designed to approach them are presented. A summary of various estimates of demand and supply conditions in different energy submarkets and the total energy market is given. Because of risks associated with import supply cutoff in the intermediate period, the feasibility of a number of stockpiling programs, including in situ storage, salt dome storage and steel dome storage is examined. Estimates of direct cost ('hard costs') and welfare and national security effects ('soft costs') are made. Funding alternatives for the stockpile programs are discussed in theory and practice. GRA

N75-17827# Development Planning and Research Associates, Inc., Manhattan, Kans.
INDUSTRIAL ENERGY STUDY OF SELECTED FOOD INDUSTRIES Final Report
Jul. 1974 582 p refs
(Contract DI-14-01-0001-1652)
(PB-237316/5; FEA/EI-1652) Avail: NTIS HC $13.25 CSCL 10A

The amount of energy used by each of 14 SIC industries within the food and kindred products industry (SIC 20) is given. Report covers the meat packing industry; sausages and other prepared meats industry; fluid milk industry; canned fruits and vegetables industry; frozen fruits and vegetables industry; animal feeds industry; wet corn milling industry; cane sugar and beet sugar industries; malt beverage industry; animal and marine fats and oils industry; manufactured ice industry; bread, cake, and related products industry; and soybean oil mills industry. GRA

N75-17828# Combustion Power Co., Inc., Menlo Park, Calif.
ENERGY CONVERSION FROM COAL UTILIZING CPU-400 TECHNOLOGY Research and Development Report, Jul. 1973 - Jun. 1974

Nov. 1974 130 p refs
(Contract DI-14-32-0001-1536)
(PB-237028/6; TR-74-105; OCR-94-INT-1) Avail: NTIS HC $5.75 CSCL 07A

Results of studies involving combustion of high-sulfur coal using CPU-400 technology are discussed. Combustion of two types of high sulfur coal (caking and non-caking) at various bed velocities and operating temperatures using limestone and dolomite as bed additives for sulfur dioxide suppression were covered. Data also cover modification of the CPU-400 process development unit to provide coal and dolomite storage and feed capability and system engineering and cycle studies. GRA

N75-17829# Martin Marietta Corp., Denver, Colo.
SOLAR THERMAL SUBSYSTEM SPECIFICATION STUDY
9 Sep. 1974 59 p refs
(Grant NSF GI-41305)
(PB-238005/3; NSF/RA/N-74-158) Avail: NTIS HC $4.25 CSCL 10B

The conceptual design of a commercial scale central receiver solar energy power plant is given and scaling considerations for a 10 MWe proof-of-concept experiment and a 5 MW thermal test facility are examined. GRA

N75-17830# Houston Univ., Tex. Dept. of Mechanical Engineering.
THE EVALUATION OF SURFACE GEOMETRY MODIFICATION TO IMPROVE THE DIRECTIONAL SELECTIVITY OF SOLAR ENERGY COLLECTORS Semiannual Progress Report, 1 Jan. - 30 Jun. 1974
John R. Howell and Richard B. Bannerot 30 Jul. 1974 36 p refs
(Grant NSF GI-41003)
(PB-236412/3; UHME/Sol/2; NSF/RA/N-74-093; NSF/RANN/SE/GI-41003/PR/74/2) Avail: NTIS HC $3.75 CSCL 10B

The performance of the flat-plate collector was enhanced with the use of spectrally (wavelength) and/or directionally selective surfaces. This document reports on progress in examining two model geometries to determine the optimum parameters that will maximize the directional selectivity. GRA

N75-17831# Army Electronics Command, Fort Monmouth, N.J.
ENGINEERING EVALUATION OF THE ZINC-MERCURIC OXIDE BATTERY/NICKEL-CADMIUM BATTERY HYBRID SYSTEM Research and Development Technical Report
Donald B. Wood Nov. 1974 18 p refs
(DA Proj. 1S7-62705-AH-94)
(AD-A001529; ECOM-4276) Avail: NTIS CSCL 10/3

Appreciable improvements in the operating characteristics of the zinc mercuric oxide (Zn/HgO) primary battery were obtained at -20F on communication (transmit/receive) type loads by using it in parallel with a nickel cadmium (NiCd) secondary battery. However, at 70F, the Zn/HgO battery-NiCd battery hybrid system failed to provide as much capacity as the Zn/HgO battery alone because of overcharge during the receive portion of the discharge. Data are presented to show the influence on capacity of duty cycle (1 minute/9 minutes versus 1 minute/4 minutes), charge current controls during the discharge (50 ohms versus 90 ohms), and discharge loads (70 ohms/1400 ohms and 140 ohms/2800 ohms). Overcharge during pre-charge of the NiCd battery by the Zn/HgO battery prior to test can have a significant effect on the final capacity obtained. GRA

N75-17832# Texas Instruments, Inc., Dallas. Semiconductor Group.
DEVELOPMENT OF VERTICAL MULTIJUNCTION SOLAR CELLS FOR SPACECRAFT PRIMARY POWER Technical Report, 1 Jan. 1973 - 31 Mar. 1974
Ronald K. Smeltzer, Rod F. Hotz, and Pradeep Shah Jun. 1974 72 p refs
(Contract F33615-73-C-2019; AF Proj. 3145)
(AD-A001084; TI-03-74-15; AFAPL-TR-74-45) Avail: NTIS CSCL 10/2

During the first half of this program to develop the vertical multijunction solar cell, new silicon technologies were developed so that three types of 2000 junction per cm packing density, vertical multijunction solar cells can be made. The new technologies include: (1) large area electron beam pattern generation, (2) orientation dependent etching, (3) epitaxial silicon refill of deep grooves, and (4) diffusion in deep grooves. Based upon the technology development achieved and the proposed VMJ cell designs, two types of cells were selected for continuing development. A few preliminary, low efficiency cells were fabricated. A small modeling effort was also undertaken to answer specific questions relevant to cell fabrication. Based upon the results obtained during this half of the program, the VMJ solar cell, although requiring very advanced fabrication techniques, is a viable device for spacecraft power in the future. Author (GRA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N75-17833 British Library Lending Div., Boston Spa (England).
THE ACTION OF EDF IN THE PREVENTION OF ATMOSPHERIC POLLUTION
M. A. Robin 4 Oct. 1974 11 p Transl. into ENGLISH from Pollution Atmospherique (France), v. 14, no. 54, Apr./Jun. 1972 p 137-141
(BLL-CE-Trans-6500-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The prevention of atmospheric pollution in France by expanding nuclear electric power generation and by developing the electric-powered automobile are discussed. Other topics discussed include thermal power stations, coal-burning power stations, electric heating, and desulfurization processes. M.J.S.

N75-17834 British Library Lending Div., Boston Spa (England).
AIR POLLUTION AND FOREST VEGETATION
W. Knabe 27 Feb. 1974 11 p refs Transl. into ENGLISH from Allgm. Forstz. (West Germany), no. 10, 1973 p 196, 198, and 200
(BLL-CE-Trans-6285-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The proceedings are presented of a symposium concerned with the effects of air pollution on forest growth. Results of research on protective measures, diagnosis, air quality criteria, and physiology are summarized. N.E.R.

N75-17835# Federal Aviation Administration, Washington, D.C. Aircraft Safety and Noise Abatement Div.
ENGINEERING AND DEVELOPMENT PROGRAM PLAN: AIRCRAFT PROPULSION SYSTEMS AIR POLLUTION
Feb. 1974 36 p ref
(AD-777484; FAA-ED-20-1) Avail: NTIS HC $3.25

A program plan to develop the means to measure, reduce, and control air pollution from aircraft powerplants and support systems is presented. The following areas of endeavor are described: (1) measurement technique development; (2) engine emission reduction; (3) general aviation emissions investigations; (4) airport pollution investigations; (5) advanced propulsion and support systems investigations; and (6) operational impact assessments. J.M.S.

N75-17836# Council on Environmental Quality, Washington, D.C.
OCS OIL AND GAS: AN ENVIRONMENTAL ASSESSMENT, VOLUME 3
Apr. 1974 199 p refs
Avail: SOD HC $2.65

The effect of natural phenomena on offshore petroleum development is discussed. Descriptions are provided of the physical systems needed for outer continental shelf petroleum production and of the natural forces to which they are exposed. Individual and collective oil spill probabilities were determined for the physical systems described, and the potential volumes of oil that would be released as a result of the effects of natural phenomena were determined. The natural phenomena considered include severe storms, the tidal surge associated with severe storms, currents, ice, earthquakes, and tsunamis. Data are presented on

winds and waves, icing, climate, oceanography, tsunami occurrence and magnitude, and earthquake events. M.J.S.

N75-17837# Council on Environmental Quality, Washington, D.C.
OCS OIL AND GAS: AN ENVIRONMENTAL ASSESSMENT, VOLUME 1
Apr. 1974 229 p refs
Avail: SOD HC $2.90

The potential environmental impacts of oil and gas development on the Atlantic and Gulf of Alaska outer continental shelves (OCS) are discussed. The relative environmental vulnerabilities of the areas studied are assessed, and procedures, requirements, and stipulations for protection and for development are recommended. The recommendations provide environmental guidance on alternative OCS development decisions. An agenda is established for action to improve OCS technology and to tighten regulation and enforcement of OCS operations. Information and methods of analysis are provided for considering environmental aspects when determining those sites of hold back from lease sale and those to offer for lease, and for integrating environmental factors into the design of an optimum leasing schedule. Author

N75-17838# Council on Environmental Quality, Washington, D.C.
OCS OIL AND GAS: AN ENVIRONMENTAL ASSESSMENT, VOLUME 2
Apr. 1974 269 p refs
Avail: SOD HC $3.70

The oil and gas reserves of the outer continental shelves and the environmental impact of their development are discussed. Other topics discussed include a summary of world oil and gas reserves, methodology of selecting hypothetical locations of oil and gas accumulations, a national energy conservation program, environmental considerations in the petroleum refining industry, and environmental quality. M.J.S.

N75-17839# Council on Environmental Quality, Washington, D.C.
OCS OIL AND GAS: AN ENVIRONMENTAL ASSESSMENT, VOLUME 4
Apr. 1974 617 p refs
Avail: SOD HC $6.65

The potential onshore effects of offshore oil and gas development on the Altantic and Gulf of Alaska outer continental shelves is presented. Backup detail on primary industries which were analyzed in depth is included along with a description of the methodology used to measure onshore socio-economic and environmental impacts. Author

N75-17840# Council on Environmental Quality, Washington, D.C.
OCS OIL AND GAS: AN ENVIRONMENTAL ASSESSMENT, VOLUME 5
Apr. 1974 583 p refs
Avail: SOD HC $6.50

Primary biological effects of potential oil discharges resulting from hypothetical oil production activity on the Atlantic/Alaskan OCS are analyzed. Although emphasis is placed on analysis of impacts and recovery from large-volume infrequent accidental oil spills, small volume continuous discharges of hydrocarbons are also considered. Effects of oil releases from offshore platforms and spills occurring at coastal terminals are assessed. Qualitative predictions are attempted which are rough order of magnitude estimates of physical, chemical, and biological changes likely to occur due to oil releases into the marine environment. An attempt is made to identify regional differences, which are relevant to pending OCS petroleum resource development decisions. Regional differences of interest include: (1) oil spill probabilities; (2) physical environmental characteristics-spill trajectories and the fate of oil in marine subsystems; and (3) biological factors relevant to oil effects. Author

N75-17841# California Univ., Livermore. Lawrence Livermore Lab.
FAST RESPONSE LIGHT SCATTERING MEASUREMENTS OF THE CHARACTERISTICS OF WIND SUSPENDED AEROSOLS
W. M. Porch and J. H. Shinn Aug. 1974 22 p refs Presented at Atmospheric-Service Exchange of Particulates and Gaseous Pollutants Symp., Richland, Wash., 4 Sep. 1974 Revised Sponsored by AEC
(UCRL-76014-Rev-1; Conf-740921-3) Avail: NTIS HC $3.25

An experiment was performed to study dust suspension by wind in Plains, Texas. A vertical pair of nephelometers at heights above ground of 35.5 and 166 cm and anemometers at various light scattering coefficient due to aerosols and air, i.e., the amount of dust in air. From the experiments it was concluded that: nephelometer measurements of dust (biased toward the respirable fraction) show strong correlation with simultaneous wind measurements; the vertical gradient of the nephelometer signals which is a measure of the flux shows a very strong power law relation to the friction velocity; and the frequency response and spectral density comparisons of the wind and dust data has proven to be a valuable tool in understanding the physical properties of dust suspension by wind. NSA

N75-17842# Oak Ridge National Lab., Tenn.
GROUND LEVEL AIR CONCENTRATIONS OF DUST PARTICLES DOWNWIND FROM A TAILINGS AREA DURING A TYPICAL WINDSTORM
M. T. Mills, R. C. Dahlman, and J. S. Olson Sep. 1974 65 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4375) Avail: NTIS HC $4.25

The atmospheric transport of contaminants is an import aspect of the environmental evaluation for a particular installation. An atmospheric transport model for suspension by wind of toxic particulates that have been deposited upon the ground surface is described. Dimensional arguments are given relating suspension and saltation rates. Sample calculations of ground level air concentrations are carried out for square tailings area containing uranium mill dust. A list of the computer code and sample output from this code are included. Author (NSA)

N75-17843# Oak Ridge National Lab., Tenn.
PROGRAM FOR COMPUTING THE DISPERSION OF AIRBORNE CONTAMINANTS
R. L. Stephenson Sep. 1974 50 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4674) Avail: NTIS HC $3.75

A FORTRAN program for computing the distribution of airborne pollutants has been written in two versions. One is for the IBM-360 machines and intended for calculations involving large numbers of sources. The other is a tutorial version, written for a PDP-10. The latter version provides the capability to visualize the effect of proposed sources and study the effect of changing the relevant parameters. In both versions, the output displays the calculated concentration of pollutants in the form of a rudimentary map. Author (NSA)

N75-17844# Instituto de Energia Atomica, Sao Paulo (Brazil).
APPLICATION OF ACTIVATION ANALYSIS TO THE DETERMINATION OF POLLUTANTS IN THE ATMOSPHERE
M. Miyamaru and F. W. Lima Feb. 1974 15 p refs In PORTUGUESE
(IEA-326) Avail: AEC Depository Libraries HC $4.00

Thermal neutron activation is used to analyze the elements mercury, bromine, arsenic, antimony, and selenium, quantitatively, present in the atmosphere at the campus of the University of Sao Paulo. The elements are collected in Millipore filters by suctioning about 40 cubic meters of air through the filter. Chemical separation is achieved by distillation of bromine and bromides of the other four elements, which are, lately, retained individually in anion exchanger resins. Arsenic and selenium are collected in the same resin column. Zinc, sodium, scandium, iron, copper, samarium, lathanum, potassium, tungsten, and chromium were qualitatively identified in the residue of the distillation. A Ge(Li) counter was used for the qualitative analysis of the elements in the residue and NaI(Tl) for the quantitative determination of arsenic, bromine, antimony, selenium, and mercury. All concentrations found are below maximum permissible levels for those five elements. Gold and uranium were also identified in the various samples analyzed. Author (NSA)

N75-17845# California Univ., Livermore. Lawrence Livermore Lab.
DEVELOPMENT OF AN AIR POLLUTION MODEL FOR THE SAN FRANCISCO BAY AREA Semiannual Report
27 Feb. 1974 123 p refs
(Contract W-7405-eng-48)
(UCRL-51537; SAR-2) Avail: NTIS HC $5.25

The operational planning group has completed the choice of instrumentation; coordinating and gathering data from various sources; planning where, when, and how these measurements are to be taken; planning and managing flight operations; developing a usable data storage system to achieve the data; and making the data available for model verification studies. Eighty-one fixed sites were selected to provide wind speed and direction data. Fixed vertical soundings providing wind, temperature, and humidity are available at three locations, and fixed vertical wind observations are available from two additional sites. Observations of pollutant concentrations are available from twenty-three fixed sites. Portable and mobile site observation points are designated. Flight plans have been filed. The air pollution model for the San Francisco Bay area consists of a suite of submodels that are coupled into the Livermore regional Air Quality model. The meteorological data that have been gathered, analyzed, and entered into the data bank are available as input to MACAW, a mass consistent windfield model. The topography model is esentially complete, but modifications are needed on the source emission model. NSA

N75-17846# Argonne National Lab., Ill.
ENVIRONMENTAL IMPACT HANDBOOK FOR HIGHWAY SYSTEMS
T. D. Wolsko, K. E. Nelson, and L. J. Habegger Jun. 1974 139 p refs
(Contract W-31-109-eng-38)
(ANL/ES-30) Avail: NTIS HC $5.75

A general background for transportation planners on the considerations that should be given to the environmental impact analysis of proposed highways is provided. It contains a description of the major environmental effects and describes the considerations that should be given to impact analysis and statement preparation. The primary emphasis of the report is to describe quantitative analysis techniques for assessing the air and noise impacts of highways. Noncomputerized techniques are presented, along with procedures for analysis and example calculations. These models, having application to a limited number of highway designs, are simplified versions of more complex computerized models, and their capacity is intended to provide air and noise quantitative analysis capability for the inexperienced highway planner.
Author (NSA)

N75-17847# Royal Netherlands Meteorological Inst., De Bilt.
THE GAUSSIAN PLUME MODEL [HET GAUSSISCHE PLUIMMODEL]
F. T. M. Nieuwstadt 1974 73 p refs In DUTCH; ENGLISH summary
(KNMI-WR-74-15) Avail: NTIS HC $4.25

A Gaussian plume model used for dispersion calculation was analyzed and applied to the calculation of a long term averaged concentration resulting from point- and area-source emission.
ESRO

N75-17848# Environmental Protection Agency, Ada, Okla. Treatment and Control Technology Branch.
POLLUTIONAL PROBLEMS AND RESEARCH NEEDS FOR AN OIL SHALE INDUSTRY Environmental Protection Technology Series
Fred M. Pfeffer Jun. 1974 44 p refs
(PB-236608/6; EPA-660/2-74-067; W75-00012) Avail: NTIS MF $2.25; SOD HC $0.85 as EP1.23:660-2-74-067 CSCL 08G

The oil shale resources and surface stream drainage within the Green River Formation of Colorado, Utah, and Wyoming are presented briefly. The above-ground retorting processes of the Bureau of Mines, Union Oil Company, and The Oil Shale Corporation are described, as are the physical and leaching characteristics of spent shale residues derived from each process. Oil shale retorting in place (in situ) is summarized. The area of major concern, stabilization of spent shale residues, is covered in detail. Other areas of environmental concern discussed are: retort waste water, process water from shale-oil upgrading, dewatering operations, mineral recovery, and contamination of ground-water by radioactivity. GRA

N75-17849# Recon Systems, Inc., Princeton, N.J.
WASTE OIL RECYCLING AND DISPOSAL
Norman J. Weinstein Aug. 1974 344 p refs Prepared in part by Response Analysis Corp.
(Contracts EPA-68-01-1870; EPA-68-03-0394)
(PB-236148/3; W74-12215; EPA-670/2-74-052) Avail: NTIS MF $2.25; SOD HC $4.00 as EP.123:670-2-74-052 CSCL 13B

Information was developed on sources and quantities of waste oils, current and potential recycle and disposal methods, and the environmental impact of these methods. In addition to an extensive literature search, surveys (of rerefiners, collectors and processors, the Pittsburgh Pennsylvania Metro area and Standard Industrial Classifications groups) were conducted to develop information reported. GRA

N75-17850# National Research Council, Washington, D.C. Committee on Biologic Effects of Atmospheric Pollutants.
MEDICAL AND BIOLOGIC EFFECTS OF ENVIRONMENTAL POLLUTANTS: VANADIUM
Jun. 1974 123 p refs
(PB-237182/1; ISBN-0-309-02218-5) Avail: NTIS MF $2.25; HC $5.25 Available from National Academy of Sciences, Printing and Publishing Office, 2101 Constitution Ave., Washington, D. C. 20418 CSCL 06F

In an effort to collate and evaluate the available data regarding vanadium and its effects, this report reviews such topics as: the use of vanadium and its compounds in industrial processes and products; some sources of vanadium in the ambient air; concentrations of vanadium found in the atmosphere, the earth's crust, water, food, and plants and animals; the biologic and metabolic effects of vanadium on experimental animals and on man under industrial, community and experimental conditions.
GRA

N75-17851# Rocketdyne, Canoga Park, Calif.
DESIGN OF AN OPTIMUM DISTILLATE OIL BURNER FOR CONTROL OF POLLUTANT EMISSIONS Final Report
R. A. Dickerson and A. S. Okuda Jun. 1974 268 p
(Contract EPA-68-02-0017)
(PB-236647/4; EPA-650/2-74-047) Avail: NTIS HC $8.50 CSCL 13B

Optimizing the burner design to minimize pollutant emissions when firing into refractory lined combustion chambers is considered. The atomizing characteristics, and flow and composition profiles in the combustion zones of several commercial burners were determined experimentally. Nitric oxide formation was most prevalent in the near stoichiometric combustion zones where local flow conditions led to vigorous gas mixing. These data were used to design variable geometry burners, used to optimize burner geometry for minimizing pollutant emissions. Optimum geometry burners were fabricated in fixed geometry versions and tested extensively to verify their low air pollutant emissions. Substantial reductions (about 50 percent) in NO emissions were achieved by optimizing conventional designs, with negligible emissions of other pollutants. GRA

N75-17852# Systems Science and Software, La Jolla, Calif.
EXPLOR - EXAMINATION OF POLLUTION LEVELS OF ROADWAYS Final Report, 1 Jan. 1972 - 31 May 1973
J. W. Kirsch and B. F. Mason 15 Jan. 1974 95 p refs Sponsored by Calif. State Air Resources Board
(PB-236713/4; SSS-R-74-2029; ARB-659-74-28) Avail: NTIS HC $4.75 CSCL 13B

A conservation of mass mathematical model with a second order advection-diffusion scheme, is used to calculate off-roadway, ground level carbon monoxide concentrations. EXPLOR has been validated to within the experimental error of the supplied traffic data. GRA

N75-17853# Institute of Gas Technology, Chicago, Ill.
STUDY OF INDUSTRIAL USES OF ENERGY RELATIVE TO ENVIRONMENTAL EFFECTS Final Report

M. E. Fejer and D. H. Larson Jun. 1974 324 p refs
(Contract EPA-68-02-0643)
(PB-237215/9) Avail: NTIS HC $9.25 CSCL 13B

The energy use patterns and air pollutant emissions of the 10 largest energy consuming industries in the U.S. are presented. Each industry is described in terms of basic energy consuming processes, and the amount and types of energy consumed and the air pollutant emissions for each process are presented. The energy use efficiency of each process in discussed with a view toward increasing efficiency either by improvement of the existing process or by replacement with a new process. In addition, the effects of such changes on the air pollutant emissions are determined. GRA

N75-17854# Battelle Columbus Labs., Ohio.
CHEMICAL AND PHYSICAL CHARACTERIZATION OF AUTOMOTIVE EXHAUST PARTICULATE MATTER IN THE ATMOSPHERE Annual Summary Report, 1 Jul. 1972 - 30 Jun. 1973
J. F. Foster, D. A. Trayser, C. W. Melton, and R. I. Mitchell 25 Jul. 1974 103 p
(Contract EPA-68-02-0279)
(PB-237148/2; ASR-4; CRC-APRAC-CAPE-19-70-3) Avail: NTIS HC $5.25 CSCL 13B

Physical and chemical characteristics of particulate matter from internal combustion engines are determined as a function of sampling procedure, engine operating conductions including emission control systems, fuel composition and residence time in the atmosphere. Work has proceeded using two matched automobiles to generate particulates; one is beings run only on unleaded gasoline and the other only on leaded gasoline, and both have been broken in using identical driving cycles. The total particulate emission rate from the nonleaded car is in the range 0.04-0.075 gram per mile for the 1972 FTP (Federal Test Procedures) Cycle. There is a correlation between the particulate and the hydrocarbon emission rates. GRA

N75-17855# Acurex Corp., Mountain View, Calif. Aerotherm Div.
SYSTEMS ANALYSIS REQUIREMENTS FOR NITROGEN OXIDE CONTROL OF STATIONARY SOURCES Final Report, Dec. 1973 - Feb. 1974
R. A. Brown, H. B. Mason, and R. J. Schreiber Sep. 1974 165 p refs
(Contract EPA-68-02-1318)
(PB-237367/8; Aerotherm-74-98; EPA/650/2-74-091) Avail: NTIS HC $6.25 CSCL 13B

Systems requirements for the control of nitrogen oxide (NOx) emissions from stationary sources are studied. Developments in the character of emission (NOx) sources and in (NOx) control technology are evaluated. It is concluded that planning priority should be for coal fired utility and industrial boilers, followed by stationary internal combustion (I.C.) engines. The most attractive short- and long-term option for control of (NOx) emissions is combustion modification technology. The priority items are development of techniques for control of the conversion of fuel-bound nitrogen to NO, and development of combustion modifications for the major area sources such as pipeline I.C. engines, and commercial and domestic combustion units. GRA

N75-17856# Argonne National Lab., Ill.
REDUCTION OF ATMOSPHERIC POLLUTION BY THE APPLICATION OF FLUIDIZED-BED COMBUSTION Annual Report, Jul. 1972 - Jun. 1973
G. J. Vogel, M. Haas, W. Swift, J. Riha, and C. B. Schoffstoll Jun. 1974 133 p refs
(Contract EPA-IAG-0199(D))
(PB-237366/0; ANL/ES-CEN-1006; EPA/650/2-74-057) Avail: NTIS HC $5.75 CSCL 13B

Results of a bench scale and laboratory scale experimental investigation of the feasibility of applying fluidized bed combustion of coal to power generation are given. The FBC concept would combust coal at elevated pressure (to 10 atm) in a fluidized bed of dolomite, which reacts with the SO2 formed during combustion. The partially sulfated dolomite is then regenerated. Pressurized FBC tests indicate favorable air pollutant emission control, with 90-95% reduction in SO2 emission, and with NO levels of about 150 ppm, well below EPA's performance standards for large coal boilers. Initial sorbent regeneration studies showed significant deactivation and decrepitation of the dolomite. GRA

N75-17857# Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
NO2 ACTINOMETER FOR FIELD USE Environmental Monitoring Series
Darrell E. Burch, C. Beam Ross, and Francis J. Gates Aug. 1974 55 p refs
(Contract EPA-68-02-0798)
(PB-237745/5; U-3416; EPA/650/4-74-036) Avail: NTIS HC $4.25 CSCL 07E

The development and testing of an actinometer designed to measure the actinic energy available for the photolytic dissociation of NO2 is reported. A spherical test bulb contains a mixture of NO2 and O2 when it has been in the dark for several minutes. When the bulb is exposed to solar energy NO is formed; its concentration is monitored by gas cell correlation methods involving the infrared adsorption by NO. A shutter periodically shades the test bulb from the sun for a one minute period each two minutes. During the shaded period, part of the NO recombines with O2 to form NO2. The cyclic change in the NO concentration is related to the actinic irradiance. GRA

N75-17858# Interagency Working Group on Health and Environmental Effects of Energy Use, Washington, D.C.
REPORT OF THE INTERAGENCY WORKING GROUP ON HEALTH AND ENVIRONMENTAL EFFECTS OF ENERGY USE
Final Report
Nov. 1974 714 p
(PB-237937/8) Avail: NTIS HC $15.25 CSCL 21D

A multi-agency review of proposed energy generating technologies is presented. A list of health and environmental problems associated with each technology is given, with estimates of when each technology will be operational. Qualitative assessments are prepared for each technology identifying areas in which supplemental research needs are indicated. Research objectives and projects responsive to these needs are developed. Two program options are offered. GRA

N75-17859# Stanford Research Inst., Menlo Park, Calif.
WET SCRUBBER LIQUID UTILIZATION Final Report
Konrad Semrau and Clyde L. Witham Oct. 1974 127 p refs
(Contract EPA-68-02-1079)
(PB-237749/7; EPA/650/2-74-108) Avail: NTIS HC $5.75 CSCL 01A

The report gives results of bench-scale experiments on the ways in which energy consumption, liquid-to-gas ratio (L/G), and water vapor condensation affect the collection efficiency of a conventional, cocurrent-contact, orifice-type particulate scrubber. The test aerosol consisted of spherical particles of ammonium fluorescein with a mass-median diameter of about 0.6 micron. Scrubber collection efficiency was determined and correlated as a function of the effective friction loss across the scrubber. Without condensation or evaporation effects, scrubber efficiency was dependent only upon effective friction loss, with no independent influences of gas velocity, L/G, or contractor orifice size, except possibly in the range of very low gas velocities, L/G, and pressure drops. Large amounts of water evaporation reduced collection efficiencies; but scrubbing hot humid gas with cold water (to produce condensation) significantly increased collection efficiency. The most favorable results were obtained by presaturating the hot humid gas stream before contacting it with cold water. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N75-17860 British Library Lending Div., Boston Spa (England).
ELECTRICITY OF THE LOWER ATMOSPHERIC LAYERS AND METHODS FOR ITS MEASUREMENT
N. V. Krasnogorskaja 1973 339 p refs Transl. into ENGLISH

from Gidromet. (Leningrad), 1972 323 p
(BLL-M-23282-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 35 BLL photocopy coupons

From analysis of experimental results and theoretical calculations, the following pattern of electrical activity in cumulus clouds is developed: Cloud particles acquire electric charges from the dissffusion of ions into the surrounding medium. The great mobility of the negative ions and possible the ability of water drops to absorb mainly negative ions from the bipolar atmosphere, promotes mainly a negative charge on the cloud drops during initial development of the clouds. As the clouds develops, the process of growth of cloud drops by coalescence begins. As the electric fields drops, electrification of particles and the external electric field break up charged large drops and leads to formation of small electrified cloud particles and finally to an important increase in growth rate for the drops. Thus, as the electrical inhomogeneity in the thickening cloud increases, it leads in turn to an increase in collision efficiency of highly electrified drops, and in combination with electric coalencence assists in the formation of sudden heavy showers often observed derived thunderstorms. G.G.

N75-17861 British Library Lending Div., Boston Spa (England).
SOME CLIMATIC FEATURES OF THE POLAR VORTEX IN THE NORTHERN HEMISPHERE
D. A. Ped 1974 44 p refs Transl. into ENGLISH from Gidromet. Nauc-Issled. Cent. SSSR (Leningrad), v. 115, 1973 p 25-44
(BLL-M-23578-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 5 BLL photocopy coupons

The fluctuation of atmospheric circulation in the arctic region is studied in connection with long-range weather forecasting. The circumpolar vortex (CV) is described as the general flow of air around the pole, which is influenced by various atmospheric disturbances. The ways in which the structure of the CV affects circulation and climate patterns on the earth as a whole are discussed. Methods of determining the pole of circulation and its location and intensity are summarized and applied to a study of a low in the polar basin. Fluctuations and pulsations occurring in the vortex over the year were determined in relation to radiation conditions in the stratosphere. N.E.R.

N75-17862 British Library Lending Div., Boston Spa (England).
THE METHODOLOGY OF STUDYING COLD WINTERS
A. V. Efanova 1974 18 p refs Transl. into ENGLISH from Glav. Geof. Obs. (Leningrad), v. 299, 1974 p 66-74
(BLL-M-23579-(5828.4E)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The problem of studying severe winters occurring in large geographical regions is discussed. The fundamental difficulty encountered in studying the structure of temperature fields is presented. M.C.F.

N75-17863 British Library Lending Div., Boston Spa (England).
ATMOSPHERIC CENTRES OF ACTION AND SOLAR ACTIVITY
N. P. Emirnov 1974 15 p refs Transl. into ENGLISH from Probl. Arkt. Antarkt. (Leningrad), no. 42, 1973 p 25-30
(BLL-M-23631-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The effect of solar activity on global atmospheric circulation and the terrestrial pressure field is examined. A correlation analysis is made on the pressure variation at centers of action, in relation to solar activity. It is shown that during the second to third years after the solar maximum, climatic lows undergo a maximum rise in pressure and climatic highs undergo a maximum drop. For the Aleutian low, it is demonstrated that 15-20 percent of total variability was of a solar-induced nature. This indicates that solar activity does not play a decisive role in the variation of hydrometeorological processes, although it may be regarded as one of many factors. N.E.R.

N75-17864*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HANDBOOK FOR SPACE PROCESSING SOUNDING ROCKET SCIENCE PAYLOADS
Mar. 1975 52 p
(NASA-TM-X-72319; M-EH-75-2) Avail: NTIS HC $4.25 CSCL 04A

Current Space Processing Rocket Experiment Project objectives are described. Guidelines are recommended for various phases of the project, in reference to time, cost, and management. N.E.R.

N75-17865*# Kanner (Leo) Associates, Redwood City, Calif.
STUDIES OF THE EQUATORIAL ANOMALY IN THE F-REGION AND THE UPPER IONOSPHERE WITH SPHERICAL ION TRAPS ON THE INTERCOSMOS-2 SATELLITE
G. Gdalevich, B. Gorozhankin, I. Kutiev, D. Samardzhiev, and K. Serafimov Washington NASA Feb. 1975 19 p refs Transl. into ENGLISH from Izv. Bulg. Akad. Nauk., Geofizichi Inst., (Bulgaria), v. 19, 1974 p 71-83
(Contract NASw-2481)
(NASA-TT-F-16153) Avail: NTIS HC $3.25 CSCL 04A

The apparatus used and data processing method are described. Data are presented and discussed, indicating the presence of minima at the geomagnetic equator at 400 km altitude, mainly within + or - 5 deg of the equator. There are two maxima, mainly between 5 and 15 deg south and north of the geomagnetic equator, at altitudes of under 500 km. Night minima are indicated close to the geomagnetic equator above 900 km, with maximum geomagnetic control between 1050-1150 km. Some solar radiation influence on the equatorial anomaly is indicated. Author

N75-17866# Finnish Meteorological Inst., Helsinki.
MAGNETIC RESULTS FROM NURMIJARVI GEOPHYSICAL OBSERVATORY, 1973
1974 32 p
(ISBN-951-697-031-1; Rept-15) Avail: NTIS HC $3.75

Geophysical observations for 1973 are presented. The instrumentation of the measurements is described. N.E.R.

N75-17867# Finnish Meteorological Office, Helsinki.
OBSERVATIONS OF RADIOACTIVITY, 1973
1974 68 p
(ISBN-951-697-034-6; Rept-13) Avail: NTIS HC $4.25

The Finnish Meteorological Institute began measurements of radioisotopes in the air and rainwater in 1959 as an essential part of meteorological observations. Data and explanations are presented concerning the fraction of aerosol beta-activity that decays within 4 hours, and the fraction that remains four days after the end of the sampling period. Measurements of beta-activity in precipitation and settled dust collected in Helsinki and Ivalo were included. Author

N75-17868*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IN SITU MEASUREMENTS OF PLASMA DRIFT VELOCITY AND ENHANCED NO(+) IN THE AURORAL ELECTROJECT BY THE BENNETT SPECTROMETER ON AE-C
Henry C. Brinton Nov. 1974 15 p refs Submitted for publication
(NASA-TM-X-70821; X-621-74-343) Avail: NTIS HC $3.25 CSCL 04A

Simultaneous measurements of ion composition and plasma drift velocity by the Bennett mass spectrometer on the Atmosphere Explorer-C satellite reveal a direct correlation between enhancements in NO(+) concentration and ion drift velocity in the southern auroral oval. Low altitude (137 to 250 km) nighttime data reveal a region of westward plasma flow at velocities up to 1.3 km/s between 62 deg and 68 deg invariant latitude, with corresponding NO(+) enhancements of up to a factor of 25. A narrow region of reverse flow at approximately 0.9 km/s was also measured. These drift observations are consistent with convective flow patterns derived from electric field measurements, and their correlation with NO(+) appears to support the suggestion that NO(+) enhancements would be expected in regions of drift owing to the dependence on ion energy of the reaction O(+) + N2 yields NO(+) + N. Author

N75-17869*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WIND ESTIMATES FROM CLOUD MOTIONS: PHASE 1 OF AN IN SITU AIRCRAFT VERIFICATION EXPERIMENT
A. F. Hasler, W. Shenk, and W. Skillman Dec. 1974 21 p

refs Submitted for publication
(NASA-TM-X-70826; X-911-74-365) Avail: NTIS HC $3.25 CSCL 04A

An initial experiment was conducted to verify geostationary satellite derived cloud motion wind estimates with in situ aircraft wind velocity measurements. Case histories of one-half hour to two hours were obtained for 3-10km diameter cumulus cloud systems on 6 days. Also, one cirrus cloud case was obtained. In most cases the clouds were discrete enough that both the cloud motion and the ambient wind could be measured with the same aircraft Inertial Navigation System (INS). Since the INS drift error is the same for both the cloud motion and wind measurements, the drift error subtracts out of the relative motion determinations. The magnitude of the vector difference between the cloud motion and the ambient wind at the cloud base averaged 1.2 m/sec. The wind vector at higher levels in the cloud layer differed by about 3 m/sec to 5 m/sec from the cloud motion vector. Author

N75-17870*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BEHAVIOR OF THE SODIUM AND HYDROXYL NIGHTTIME EMISSIONS DURING A STRATOSPHERIC WARMING
Jearl D. Walker (Cleveland State Univ.) and Edith I. Reed Jan. 1975 55 p refs Submitted for publication
(NASA-TM-X-70828; X-621-75-6) Avail: NTIS HC $4.25 CSCL 04A

The behavior of the sodium and hydroxyl nighttime emissions during a stratospheric warming has been studied principally by use of data from the airglow photometers on the OGO-4 satellite. It was found that during the late stages of a major warming, both emissions increase appreciably, with the sodium emission returning to normal levels prior to the decrease in hydroxyl emission. The emission behaviors are attributed to temperature and density variations from 70 to 94 km, and a one-dimensional hydrostatic model for that altitude range is used to calculate the effects on the emissions and on the mesospheric ozone densities. Author

N75-17871*# Analytical Systems Engineering Corp., Burlington, Mass.
THUNDERSTORMS OBSERVED BY RADIO ASTRONOMY EXPLORER 1 OVER REGIONS OF LOW MAN MADE NOISE Final Report, 13 Mar. 1973 - 13 Mar. 1974
Joseph A. Caruso and John R. Herman May 1974 45 p refs (Contract NAS5-23224)
(NASA-CR-143678; ASCR-73-52) Avail: NTIS HC $3.75 CSCL 04B

Radio Astronomy Explorer (RAE) I observations of thunderstorms over regions of low man-made noise levels are analyzed to assess the satellite's capability for noise source differentiation. The investigation of storms over Australia indicates that RAE can resolve noise generation due to thunderstorms from the general noise background over areas of low man-made noise activity. Noise temperatures observed by RAE over stormy regions are on the average 10DB higher than noise temperatures over the same regions in the absence of thunderstorms. In order to determine the extent of noise contamination due to distant transmitters comprehensive three dimensional computer ray tracings were generated. The results indicate that generally, distant transmitters contribute negligibly to the total noise power, being 30DB or more below contributions arriving from an area immediately below the satellite. Author

N75-17872# Indian Inst. of Geomagnetism, Bombay.
WORLD DIGITAL DATA CENTRE C2: USER MANUAL AND ABRIDGED CATALOGUE FOR GEOMAGNETIC DATA
Jan. 1975 25 p
Avail: NTIS HC $3.25

The organization and functions of the Digital Data Center are outlined. The formats of the arrangement of data are listed. N.E.R.

N75-17873*# Atlantic Science Corp., Indialantic, Fla.
INVESTIGATION OF THE IONOSPHERIC FARADAY ROTATION FOR USE IN ORBIT CORRECTIONS
Sigrid K. Llewellyn, Rodney B. Bent, and George Nesterczuk Dec. 1974 113 p refs
(Contract NAS5-21972)
(NASA-CR-143692; ASC-74-F-016) Avail: NTIS HC $5.25 CSCL 03B

The possibility of mapping the Faraday factors on a worldwide basis was examined as a simple method of representing the conversion factors for any possible user. However, this does not seem feasible. The complex relationship between the true magnetic coordinates and the geographic latitude, longitude, and azimuth angles eliminates the possibility of setting up some simple tables that would yield worldwide results of sufficient accuracy. Tabular results for specific stations can easily be produced or could be represented in graphic form. Author

N75-17874# Joint Publications Research Service, Arlington, Va.
AURORAS AS A WINDOW TO SPACE
Ya. I. Feldshteyn 6 Feb. 1975 16 p refs Transl. into ENGLISH from Priroda (USSR), no. 11, Nov. 1974 p 52-60
(JPRS-64048) Avail: NTIS HC $3.25

Data on observation of auroras which in principle make possible continuous tracking of the state of circumterrestrial space is presented. Author

N75-17875*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
RESULTS OF MAGNETOSPHERIC BARIUM ION CLOUD EXPERIMENT OF 1971
David Adamson, Clifford L. Fricke, and Sheila Ann T. Long Washington Mar. 1975 64 p refs
(NASA-TR-R-437; L-9914) Avail: NTIS HC $4.25 CSCL 04A

The barium ion cloud experiment involved the release of about 2 kg of barium at an altitude of 31 482 km, a latitude of 6.926 N., and a longitude of 74.395 W. Significant erosion of plasma from the main ion core occurred during the initial phase of the ion cloud expansion. From the motion of the outermost striational filaments, the electric field components were determined to be 0.19 mV/m in the westerly direction and 0.68 mV/m in the inward direction. The differences between these components and those measured from balloons flown in the proximity of the extremity of the field line through the release point implied the existence of potential gradients along the magnetic field lines. The deceleration of the main core was greater than theoretically predicted. This was attributed to the formation of a polarization wake, resulting in an increase of the area of interaction and resistive dissipation at ionospheric levels. The actual orientation of the magnetic field line through the release point differed by about 10.5 deg from that predicted by magnetic field models that did not include the effect of ring current. Author

N75-17876*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PRESSURE CONTACT SOUNDING DATA FOR NASA'S ATMOSPHERIC VARIABILITY EXPERIMENT (AVE 2)
Henry E. Fuelberg (Texas A and M Univ., College Station) and Robert E. Turner Washington Mar. 1975 24 p refs
(NASA-TN-D-7914) Avail: NTIS HC $3.25 CSCL 04A

The basic rawinsonde data are described at each pressure contact from the surface to sounding termination for the 54 stations participating in the AVE 2 pilot experiment. Soundings were taken at three-hour intervals from stations within the United States east of about 105 degrees west longitude. Methods of data reduction and estimates of data accuracy are discussed. Examples of the data records produced are shown. The AVE 2 pilot experiment was conducted as part of NASA's program to better understand and establish the extent of applications for meteorological satellite sensor data through correlative ground truth experiments and to provide basic experimental data for use in studies of atmospheric scales-of-motion interrelationships. Author

N75-17877*# Lockheed Missiles and Space Co., Palo Alto, Calif. Space Sciences Lab.
A MULTI-SATELLITE STUDY OF THE NATURE OF WAVE-LIKE STRUCTURES IN THE MAGNETOSPHERIC PLASMA Final Report
Edward G. Shelley 22 Aug. 1974 30 p refs
(Contracts NASw-2551)

(NASA-CR-143680; LMSC/D405375) Avail: NTIS HC $3.75 CSCL 20N

An intercomparison is made of the wavelike structures in the data from the light ion mass spectrometer and the fluxgate magnetometer on OGO 5. The wavelike structures appear simultaneously in the data from both experiments. The waves contain both transverse and compressional modes and exhibit periods of 100 to 200 seconds. The waves are usually observed outside the plasmapause and are located primarily on the dayside of the magnetosphere. One possible cause of the apparent density fluctuation is a velocity modulation of the thermal plasma which causes the particles to drift into and out of the ion spectrometer. Author

N75-17878*# California Univ., Los Angeles. Dept. of Planetary and Space Science.

FEASIBILITY OF HYDROMAGNETIC WAVE MEASUREMENTS ON SPACE SHUTTLE

Robert L. McPherron 12 Aug. 1974 71 p refs Prepared for Battelle-Northwest

(Grant NGL-05-007-004; Contract AT(45-1)-1830)

(NASA-CR-136742) Avail: NTIS HC $4.25 CSCL 08N

The feasibility of using a hydromagnetic wave sensor on the space shuttles was investigated. It was found that although existing sensors are inadequate in terms of resolution, dynamic range, and frequency range, they can be modified to make the necessary measurements. It is shown that since the sensor cannot be mounted on the shuttle itself because of high levels of magnetic noise, a free subsatellite that can be positioned and stabilized may be used for locating the hydromagnetic wave sensor. Other results show that studies of long period waves would require either an array of sensors in shuttle orbit or a long-term mapping of the crustal anomalies, and that effective wave studies would require at least two variably spaced sensors in shuttle orbit and one ground station. M.J.S.

N75-17879# California Univ., Livermore. Lawrence Livermore Lab.

NUMERICAL MODELING OF PRECIPITATION SCAVENGING BY CONVECTIVE CLOUDS

Sep. 1974 41 p refs Presented at Precipitation Scavenging Conf., Champaign, Ill., 13 Oct. 1974

(UCRL-75896; Conf-741003-4) Avail: NTIS HC $3.75 CSCL 04A

A one-dimensional model of cumulus convection with parameterized microphysics modified to include a scavenging calculations was used to determine the amount and distribution of pollutants carried by precipitation. A typical convective cloud can easily deposit efficient condensation nuclei initially suspended at low levels in amounts equal to the initial vertical integral of the pollutant material. For larger clouds and greater nucleation efficiencies several initial vertical integrals could be rained out. The amount of pollutant left behind in the atmosphere in the vertical column where the cloud existed can be larger than the initial vertical integral of pollutant even when the material is efficiently scavenged. This result indicates that the region of the atmosphere that has a small amount of pollutant after being influenced by convective clouds is the region between clouds where air with a lower concentration of pollutant has been advected to lower levels replacing air with a higher concentration of pollutant. Author (GRA)

N75-17880# Naval Research Lab., Washington, D.C.

ROCK MAGNETITES WITH POSITIVE ANISOTROPY CONSTANTS AT 300

D. L. Griscom, M. P. Ohoro (Xerox Corp., Webster, N.Y.), and R. A. Weeks (ORNL) 1974 9 p refs Presented at the Takesi Nagata Conf., Pittsburgh, 3 Jun. 1974

(Conf-740644-1) Avail: NTIS HC $3.25

The use of ferromagnetic resonance as an easy and reliable method of measuring both the sign and magnitude of the anisotropy field of fine grained ferromagnetic minerals is discussed with emphasis on submicroscopic magnetites. The FMR discussion involves studying the resonant absorption of microwaves by a sample as a function of a laboratory applied magnetic field. Computer simulated powder spectra for cubic anisotropy for an X-band spectrometer frequency and room temperature X-band FMR spectra of ferric ion spinel precipitates in a DSDP basalt and two synthetic glasses are shown. The best characterized sample investigated to show the positive anisotropy constants at 300 K is a calcium alumino-boro-silicate glass melted to contain ferric and ferrous ions in a 2:1 ratio and precipitated at 600 C. The FMR spectra of a separate of green glass balls from Apollo 15 lunar sample 15426 believed to contain magnetite-like phases were analyzed. NSA

N75-17881# Stockholm Univ. (Sweden). Inst. of Meteorology.

HIGH-LATITUDE OZONE SOUNDINGS WITH A ROCKET-BORNE MULTI-WAVELENGTH SOLAR IRRADIANCE PHOTOMETER. PART 1: DATA ANALYSIS PROCEDURES AND EXPERIMENTAL RESULTS

Sven Grahn and Georg Witt 5 Sep. 1974 51 p refs Sponsored by Swed. Space Res. Comm.

(AP-16-Pt-1) Avail: NTIS HC $4.25

A series of five Skua rockets was launched from ESRANGE during different phases of the morning twilight. The aim of the experiment was to study the effect of sunrise on the charged particle composition of the D-layer. Each rocket was instrumented with Faraday-rotation equipment and a solar irradiance photometer which measured the attenuation of sunlight in four different wavelength regions. The ozone profile between 35 and 70 km and also the variations of the mesospheric ozone density with changing solar zenith angle was determined. The low altitude portions of the observed 03 profiles are in good agreement with results from other investigations. Above 60 km the 03 concentration is close to but somewhat lower than those obtained by others. Measuring technique and computational errors are discussed. Author (ESRO)

N75-17882# Royal Netherlands Meteorological Inst., De Bilt.

SEISMIC RECORDS AT DE BILT, VOLUME 57, 1969

1974 67 p

(KNMI-108-57) Avail: NTIS HC $4.25; Roy. Neth. Meteorol. Inst. F7.50

Data from seismographs at De Bilt (Netherlands) during 1969 are presented in tabular form. Data recorded at other locations in the Netherlands are included for comparison. The distance of the epicenter and the depth of origin have been calculated by means of curves constructed with the aid of time tables. ESRO

N75-17883# Aerospace Corp., El Segundo, Calif. Lab. Operations.

AURORAL EMISSION OF THE N2(+) MEINEL BANDS Interim Report

David C. Cartwright, William R. Pendleton, Jr., and Lawrence D. Weaver 18 Sep. 1974 24 p refs

(Contract F04701-74-C-0075)

(AD-A000568; TR-0075(5542)-1; SAMSO-TR-74-227) Avail: NTIS CSCL 04/1

New cross sections for electron impact excitation and quenching of the N2(+) Meinel bands have been combined with recently determined transition probabilities to yield altitude profiles of the Meinel bands relative to those for the N2(+) First Negative System. Quenching of the Meinel bands is found to be important for altitudes less than 120 km. The calculated intensity of the Meinel band system relative to that of the First Negative System agrees reasonably well with the more recent auroral measurements. Author (GRA)

N75-17884# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE SIZE DISTRIBUTION OF CLOUD DROPS IN A TURBULENT ATMOSPHERE

V. I. Smirnov and A. S. Kabanov 4 Oct. 1974 20 p refs Transl. into ENGLISH from Tr. Tsentr. Aerolog. Observ. (Moscow), no. 101, 1972 p 3-12

(AD-A000178; FTD-MT-24-1468-74) Avail: NTIS CSCL 04/1

The theory of condensation growth of drops under conditions when the supersaturation of vapor fluctuates due to turbulence appeared as one of the possible explanations of the observed wide size distributions of cloud drops. This work analyzes an approach to this problem developed basically in the works of L. M. Levin and Yu. S. Sedunov. An approach is also proposed based on the consideration of fluctuations of the concentration

of nascent drops together with a difference in condensation levels. GRA

N75-17885# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON THE COMPUTATION OF THE INERTIAL ERRORS IN THE MEASUREMENT OF HUMIDITY BY THE RADIOSONDE A-22-III
G. A. Nikolskii and A. V. Smirnov 23 Oct. 1974 18 p refs Transl. into ENGLISH from Probl. Fiz. Atm. (USSR), no. 7, 1969 p 166-175
(FTD Proj. T74-01-19)
(AD-A000358; FTD-MT-24-2319-74) Avail: NTIS CSCL 04/2

The inertia of skin hygrometers is compared with that of hair hygrometers. Equations for determining the inertial coefficient are provided for use with skin hygrometers. These are used in connection with radiosonde data to obtain a distribution of relative humidity in a cloud layer. It is concluded that correction for inertial errors is necessary to obtain a precise position of boundaries for cloud layers. N.E.R.

N75-17886# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FIELD IONOSPHERIC MEASUREMENT UNIT
B. O. Vugmeister, V. I. Gorin, and Yu. F. Solovev 18 Oct. 1974 13 p refs Transl. into ENGLISH from Issled. Geomagnetizmu, Aeronomii Fiz. Solntsa (USSR) no. 18, 1971 p 261-269
(FTD Proj. T74-01-19)
(AD-A000626; FTD-HC-23-2511-74) Avail: NTIS CSCL 04/1

A mobile ionospheric measurement unit is described. It permits one to obtain the altitude-frequency characteristics of the ionosphere, and also to measure the drift parameters of the inhomogeneities by the method of range-frequency spaced reception with a small signal base. The output devices are designed for the use of an analog-code converter. Author (GRA)

N75-17887# Danish Meteorological Inst., Copenhagen. Geophysical Dept.
IONOSPHERIC RESEARCH USING SATELLITES Interim Scientific Report, 1 Nov. 1973 - 30 Jun. 1974
Ib Steen Mikkelsen 31 Aug. 1974 10 p ref
(Contract AF-AFOSR-2161-72; AF Proj. 4643)
(AD-A000590; AFCRL-TR-74-0501; ISR-3) Avail: NTIS CSCL 04/1

The total vertical electron content (TEC) is found from the Faraday-rotation of the 137 MHz beacon of ATS-3 recorded at Narssarssuaq. In order to see some general influence of geomagnetic activity upon TEC, the scaled values have been averaged in the following manner: step 1 - the hourly mean values have been computed; step 2 - the days have been gathered in groups of 27 days. Night time effects, afternoon decrease, and the maximum of TEC are discussed. Author (GRA)

N75-17888# New York Univ., N.Y. Inst. of Mathematical Sciences.
GEOSTROPHIC VORTICES ON A CIRCLE OF LATITUDE IN A CAP ON A ROTATING SPHERE
A. S. Peters Jul. 1974 49 p refs
(Grant AF-AFOSR-2728-74)
(AD-A000478; IMM-404; AFOSR-74-1660TR) Avail: NTIS CSCL 04/1

This report contains an analysis of the linear stability of the motion of n-l geostrophic vortices confined in a polar cap on a rotating sphere. It is supposed that initially one vortex is at the north pole while the others are symmetrically arranged on a circle of latitude; and that the motion is subject to a certain condition along the latitude circle which bounds the cap. The development stems from the demonstration that a concentrated geostrophic vortex in a rotating spherical layer is characterized by a singular spherical harmonic of degree nu and order zero. This function has a role analogous to that of the Bessel function which characterizes a rectilinear geostrophic vortex in a rotating planar layer. Author (GRA)

N75-17889# GCA Corp., Bedford, Mass. Technology Div.
LASER BACKSCATTER DENSITY SYSTEM Final Report, 1 Jul. 1972 - 30 Jun. 1974
Andrew Tomlinson Sep. 1974 53 p refs
(Contract F19628-72-C-0363; AF Proj. 8605)
(AD-A000508; GCA-TR-74-4-A; AFCRL-TR-74-0460) Avail: NTIS CSCL 04/1

An instrument has been designed and fabricated to measure total atmospheric density in the thermosphere over the altitude range of 90 to 160 km. The payload is to be mounted on an Aerobee 150. The measurement technique involves Rayleigh backscatter of a pulsed laser operating at a wavelength of about 460 nanometers. GRA

N75-17890# Army Foreign Science and Technology Center, Charlottesville, Va.
METHODS AND TECHNIQUES OF EXPERIMENTAL INVESTIGATION OF THE ATMOSPHERE
N. S. Livshits 23 Feb. 1974 70 p refs Transl. into ENGLISH from unidentified Russian monograph
(AD-A001474; FSTC-HT-23-1708-73) Avail: NTIS CSCL 04/1

Contents: The noise immunity of a telemetering sounding system in the atmosphere; Azimuthal observations of meteor trail drifts; The data processing program for the RKZ-RMS sounding system for the Minsk-22 electronic digital computer; Analysis of the signal spectrum features of the RKZ radiosonde; The fading of the meteorological signals of the RKZ-meteor radiosounding system; The pause-mode operation of the superregenerator; Study of operation of the superregenerative transponder; Apparatus complex for the study of some elements of the energetic balance in the upper atmosphere. GRA

N75-17891# Ohio State Univ., Columbus. ElectroScience Lab.
ABSORPTION COEFFICIENT MEASUREMENTS OF CO2 HDO-N2, AND CH4-AIR USING A DF LASER Final Report
F. S. Mills and R. K. Long Aug. 1974 20 p refs
(Contract F30602-72-C-0016; AF Proj. 1279)
(AD-A001097; ESL-3271-10; RADC-TR-74-295) Avail: NTIS CSCL 07/4

The report presents measurements of the absorption of HDO-N2 mixtures when illuminated with a DF laser operating on the 3-2 P(6) to P(8) lines. Similar data is presented for pure CO2 and the 2-1 P(8) DF line. Measurements of CH4-Air mixtures are presented for the 2-1 P(6) - P(8) DF lines. Author (GRA)

N75-17892# Naval Postgraduate School, Monterey, Calif.
PARAMETERIZATION OF SOLAR ABSORPTIVITY AND TRANSMISSIVITY USING NIMBUS 2 REFLECTANCE DATA M.S. Thesis
Donald Jeremiah Healy Sep. 1974 64 p refs
(AD-A001253) Avail: NTIS CSCL 04/1

In this study, satellite measurements of reflected solar insolation from NIMBUS II were combined with simultaneous pyrheliometer readings of transmissivity over North America to provide the basis for computation of the atmospheric absorptivity. In the statistical parameterization of the absorptivity, such readily available data as water vapor mass and satellite reflectance were introduced as independent variables in the regression equations. Correlation coefficients between observed regression-determined absorptivities and transmissivities were computed based upon an initial total of 235 data-samples, and the results interpreted. GRA

N75-17893# Army Foreign Science and Technology Center, Charlottesville, Va.
ELECTROMAGNETIC METHODS OF DISTANCE MEASUREMENT AND CALCULATION OF THE INFLUENCE OF EXTERNAL CONDITIONS
A. Genike and Yu. S. Galkin 20 Feb. 1974 15 p ref Transl. into ENGLISH from Geod. i Kartografiya (USSR), No. 11, Nov. 1972 p 10-16
(AD-A001211; FSTC-HT-23-1607-73) Avail: NTIS CSCL 08/5

A report is made on lectures given at the 15th General Assembly of the International Union of Geodesy and Geophysics. Various speakers touched on the use of new equipment for more accurate measurement of lines and angles. In spite of several innovations, not enough work had been done, in the

field, to prove the efficiency of techniques developed in the laboratory. GRA

N75-17894# Army Foreign Science and Technology Center, Charlottesville, Va.
EFFECT OF HUMIDITY AND AEROSOL CONCENTRATION ON ATMOSPHERIC TRANSPARENCY
N. I. Goisa, T. V. Zheleznyakova, and V. M. Soshin 1 May 1974 15 p refs Transl. into ENGLISH from Tr. Nauchn.-Issled. Gidrometeorol. Inst. (Kiev), no. 77 p 94-101
(AD-A001499; FSTC-HT-23-410-74) Avail: NTIS CSCL 04/2

The effect of water vapor and aerosol content on atmospheric transparency in the Kiev area is characterized in this article. Measurements of direct solar radiation and radiosonde data of the vertical distribution of specific humidity in the 1954-1961 period were used. GRA

N75-17895# Tri-Con Associates, Inc., Cambridge, Mass.
DESIGN INSTRUMENTATION FOR USE IN MEASURING ATMOSPHERIC DENSITY Final Report, 30 Mar. 1972 - 30 Mar. 1974
Robert M. Thornton Jul. 1974 47 p refs
(Contract F19628-72-C-0310; AF Proj. 6690)
(AD-A000931; C-1117; AFCRL-TR-74-0323) Avail: NTIS CSCL 04/1

The objective of this contract was to design, fabricate, assemble, test, calibrate and prepare for launch satellite-borne instrumentation to measure upper atmospheric density using two Cold Cathode Density Gauges and one Hot Filament Density Gauge. A further objective was to modify a Government furnished Cold Cathode Density Gauge System to make it compatible with the satellite specifications. GRA

N75-17896# Institut d'Aeronomie Spatiale de Belgique, Brussels.
STRATOSPHERIC CONSTITUENTS Final Report, 15 Sep. 1972 - 14 Sep. 1974
M. Ackerman, J. C. Fontanella, D. Frimout, A. Girard, and N. Louisnard 1 Nov. 1974 41 p refs
(Contracts N00014-73-C-0076; DOT-AS-20023; NR Proj. 211-166)
(AD-A001559) Avail: NTIS CSCL 04/1

Simultaneous measurements of NO and NO2 in the stratosphere leading to an NOx determination have been performed by means of infrared absorption spectrometry using the sun as a source in the 5.2 micrometer band of NO and in the 6.2 micrometer band of NO2. The observed abundance of NOx peaks at 26 km. The volume mixing ratio of NOx was observed to vary. GRA

N75-17897# Hawaii Univ., Honolulu. Dept. of Meteorology.
A SPACE-CHARGE RADIOSONDE FOR THE STUDY OF WARM CLOUD ELECTRICITY
Tsutomu Kakahashi and Takeharu Gima Aug. 1974 26 p refs
(Contract N00014-67-A-0387-0015; Grant NSF GA-41024)
(AD-A000820; UHMET-74-03) Avail: NTIS CSCL 04/1

A radiosonde instrument package has been developed to measure the electrical space charge within clouds. Particular attention was given to minimizing such difficulties as contact potential, leakage through the insulation, and the accumulation of electric charge on the instrument housing. After initial testing, eleven radiosonde flights into the clouds were carried out. The resulting charge-elevation profiles are characterized by a gradual decrease of the positive space charge with increasing height in fair weather, and by negative space charge within clouds during rain. It was found that in warm clouds the contribution of small-particle electric charge to the total charge is substantial. Author (GRA)

N75-17898# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL METHODS OF ATMOSPHERIC AEROSOL RESEARCH 1. METHODS OF SAMPLE COLLECTION AND ANALYSIS
O. M. Surikov 7 Oct. 1974 23 p refs Transl. into ENGLISH from Probl. Fiz. Atm. (USSR), no. 6, 1968 p 63-77
(AD-A000112; FTD-HC-23-2117-74) Avail: NTIS CSCL 07/4

Methods of sampling and analysis of atmospheric aerosols are discussed. Thermal, gravitational, electrostatic, and inertial precipitation and filters are briefly described. Optical and electron microscopy and neutron activation analysis for determining chemical properties are also discussed. GRA

N75-17899# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
DYNAMICS AND STRUCTURE OF THE QUIET THERMOSPHERE Air Force Surveys in Geophysics.
K. S. W. Champion 17 Jul. 1974 30 p refs Presented at STP Symp., Sao Paulo, Brazil, Jun. 1974
(AF Proj. 6690) .
(AD-A000923; AFCRL-TR-74-0318; AFCRL-AFSC-290) Avail: NTIS CSCL 04/1

The COSPAR International Reference Atmospheres (CIRA) 1972 provides both a Mean International Reference Atmosphere of the thermosphere and a parametric set of models for the region. The models are based on knowledge of the thermosphere as of mid 1971. The differences in the diurnal variations of atmospheric density scale height obtained from satellite drag studies and temperatures obtained from incoherent radar scatter observations are probably due to different diurnal variations of density and temperature and not due to systematic discrepancies in the measurements. The answer to this question should be provided by data obtained from recently launched satellites ESRO IV, AEROS, and AE-C. The second major area of interest involves the absolute number densities and variations with time of day, latitude, and season of the major and minor constituents of the thermosphere. Recent data obtained with mass spectrometers and optical instruments are reviewed in addition to the results of theoretical composition calculations, which include turbulence and other transport effects. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N75-17900 Freie Univ., Berlin (West Germany).
METEOROLOGICAL DATA. VOLUME 141, NUMBER 7: RESULTS OF THE SYNOPTIC SERVICE DURING 1974. DAILY AND MONTHLY WEATHER MAPS (GROUND, 850 mb, 500 mb), TABLES AND BRIEF SCIENTIFIC ARTICLES [METEOROLOGISCHE ABHANDLUNGEN. BAND 141, HEFT 7: ERGEBNISSE DES SYNOPTISCHEN DIENSTES IM JAHRE 1974. TAEGLICHE UND MONATLICHE WETTERKARTEN (BODEN, 850 mb, 500 mb), TABELLEN UND KLEINERE WISSENSCHAFTLICHE AUFSAETZE]
Jul. 1974 168 p In GERMAN
Avail: Issuing Activity

Daily and monthly Northern Hemisphere ground level, 850 mb and 500 mb height and temperature analyses of constant pressure levels for July 1974 are presented. Included scientific studies cover aspects of synoptic climatology over the Berlin sector, data on atmospheric radioactivity and dust content, and a weather forecast for summer 1974. Transl. by G.G.

N75-17901 British Library Lending Div., Boston Spa (England).
STATISTICAL PARAMETERS OF THE WIND IN THE EQUATORIAL ZONE AND IN MIDDLE LATITUDES
T. P. Kalugina and M. V. Kartasova 1974 21 p refs Transl. into ENGLISH from Gidromet. Nauc-Issled. Cent. SSSR (Leningrad), v. 39, 1969 p 67-83
(BLL-M-23537-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The investigation is described for the distribution of the average fields of the zonal and meridional components of the wind. The correlation functions obtained for these components are given. The zonal circulation in low latitudes and the formation of tropical, equatorial jet streams are considered. M.C.F.

N75-17902 British Library Lending Div., Boston Spa (England).
AN OBJECTIVE COMPUTER METHOD OF FORECASTING AIR TEMPERATURE ANOMALIES FOR THREE CONSECUTIVE FIVE-DAY PERIODS

H. H. Rafailova 1974 18 p refs Transl. into ENGLISH from Gidromet. Nauc-Issled. Cent. SSSR (Leningrad), v. 120, 1973 p 39-47
(BLL-M-23586-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

A method is presented for forecasting mean air temperature anomalies by making use of the circulation in the lower and middle stratosphere (in conjunction with the characteristics of the troposphere and the underlying surface. To characterize the energetics of the air masses participating directly in the formation of weather in the surface layers, the thermal condition of the lower 5 km in the troposphere was used. The mutual distribution and intensity of the centers of positive and negative anomaly in the daily temperature deviation were also considered. M.J.S.

N75-17903 British Library Lending Div., Boston Spa (England).
METHODOLOGY OF COMPUTING CORRELATION FUNCTIONS AND SPECTRA OF TEMPORAL METEOROLOGICAL SERIES
K. Ja. Vinnikov, N. K. Grib, and I. I. Poljak 1974 40 p refs Transl. into ENGLISH from Glav. Geof. Obs. (Leningrad), v. 308, 1973 p 27-46
(BLL-M-23585-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

A method was investigated for computing the correlation functions and spectra of meteorological time series. The formal scheme is presented along with ALGOL programs which can be used for analyzing series without gaps, whenever the Fourier transforms cannot be used. In order to obtain reliable spectral estimates both in broad frequency band and in narrow portions of the spectrum, the program also includes a filtration apparatus for the correlation function. M.J.S.

N75-17904 British Library Lending Div., Boston Spa (England).
SEASONAL WEATHER CONDITIONS AS CONNECTED WITH THE TIMING OF THE SPRING CHANGE-OVER IN STRATOSPHERIC CIRCULATION
D. A. Ped 1974 15 p refs Transl. into ENGLISH from Gidromet. Nauc-Issled. Centr. SSSR (Leningrad), v. 120, 1973 p 57-67
(BLL-M-23583-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The effect of the spring changes in stratospheric circulation on the weather in the Soviet Union was investigated. The transition from a westerly to easterly regime of the circumpolar vortex was assigned to an early, mean, or late class. It was found that an early restructuring of the wind field leads to a warm summer, and a late one to a cool summer. F.O.S.

N75-17905 British Library Lending Div., Boston Spa (England).
THE IMPORTANCE OF SYSTEMS ANALYSIS METHODS IN METEOROLOGY
W. Fett 1974 29 p refs Transl. into ENGLISH from Ann. Met. (West Ger.), no. 6, 1973 p 97-109
(BLL-M-23627-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

A systematic analysis approach to meteorology is discussed. The fundamental principles of systems theory, and systems analysis models are also discussed. F.O.S.

N75-17906 British Library Lending Div., Boston Spa (England).
SOME HYDROCLIMATIC CHARACTERISTICS OF THE DECADE 1961-1970 IN THE NORTH ATLANTIC AND IN THE ARCTIC OCEAN
M. Rodewald 1974 73 p refs Transl. into ENGLISH from Deut. Hydrogr. Z. (West Germany), no. 25, 1972 p 97-117 In ENGLISH and GERMAN
(BLL-M-23345-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 7 BLL photocopy coupons

A cooling trend in the North Atlantic is established by a comparison of data from nine stations. Seasonal variations and regional distribution of the phenomenon are discussed. A correlation was found between the intensity of a low in Iceland and the sea temperature south of it. The effects of the formation of anticyclonic winds as a result of the high established in Iceland and Greenland are briefly described. A tabular summary is provided of previous and current sea temperature means. N.E.R.

N75-17907 British Library Lending Div., Boston Spa (England).
METEOROLOGICAL APPLICATIONS OF A LASER BEAM
O. Kostko 1974 4 p Transl. into ENGLISH from Kazakhstansk. Pravda (USSR), 20 Nov. 1973
(BLL-M-23321-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Laser technology is used to determine the density of the lower strata of the earth's atmosphere. The data obtained conform well to the density measurements performed simultaneously with radiosondes. Remote measurement investigation of atmospheric conditions with laser locaters can replace methods requiring the use of lifting devices, such as pilot balloons and meteorological rockets. Author

N75-17908 British Library Lending Div., Boston Spa (England).
WEATHER RADAR AS AN IMPORTANT AND ECONOMIC METEOROLOGICAL SENSOR, AND AS A COMPONENT OF A FUTURE PRECIPITATION NETWORK
L. J. Breuer 1974 23 p refs Transl. into ENGLISH from Ann. Met., N. F. (West Ger.), no. 6, 1973 p 121-129
(BLL-M-23307-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

Possible qualitative and quantitative methods of precipitation measurement by microwaves are shown. A network for forecasting and measuring rainfall is proposed which used economical modules with appropriate software. Each station of this network can be operated by an untrained technician or by remote control from a central station. The real and expected precipitation and the displacement of rainfall areas can be documented and stored for climatological and commercial utilization. The limitations of the technical practicability according to the meteorological requirements are discussed. Author

N75-17909 British Library Lending Div., Boston Spa (England).
THE METEOROLOGICAL CONDITIONS FOR CLIMATIC THERAPY AND HOLIDAYS IN KAZAKHSTAN IN THE WARM SEASON OF THE YEAR
I. A. Afanaseva, L. N. Bondarenko, and T. S. Rusmanova [1974] 13 p refs Transl. into ENGLISH from Vopr. Geog. (Moscow), no. 89, 1972 p 130-142
(BLL-M-23590-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The general features of the Kazakhstan climate during the warm part of the year (April through August) are described along with the meteorological conditions needed for climate therapy. Other topics discussed include cyclonic disturbances, precipitation, temperature ranges, and radiation conditions. M.J.S.

N75-17910# Royal Aircraft Establishment, Farnborough (England).
CLOUD COVER IN THE MECKLENBURG REGION OF THE BALTIC SEA
R. Knepple Dec. 1974 28 p refs Transl. into ENGLISH from Z. Meteorol. (West Ger.), v. 5, no. 1, 1951 p 14-26
(RAE-Lib-Trans-1632; BR46091) Avail: NTIS HC $3.75

Results are given of a climatic investigation of cloud cover in the Mecklenburg region of the Baltic Sea coast. The annual and daily variation of cloud cover, its behavior in comparison with stations on the North Sea, the eastern Baltic Sea, inland, and in Southern Germany, as well as the dependence of cloud cover on the wind direction, were investigated. Author

N75-17911*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A MULTISENSOR ANALYSIS OF NIMBUS-5 DATA RECORDED ON 22 JANUARY 1973
L. J. Allison, E. B. Rodgers, T. T. Wilheit, and R. Wexler Washington Mar. 1975 47 p refs
(NASA-TN-D-7911; G-7507) Avail: NTIS HC $4.25 CSCL 14B

The Nimbus 5 meteorological satellite has a full complement of radiation sensors. Data from these sensors were analyzed and intercompared for orbits 569 and 570. The electrically-scanning microwave radiometer (19.35-GHz region) delineated rain areas over the ocean off the U.S. east coast, in good agreement with radar imagery, and permitted the estimation of rainfall rates in this region. Residual ground water, from abnormal rainfall in the lower Mississippi Valley, was indicated under clear

sky conditions by soil brightness temperature values in the Nimbus 5 electrically scanning microwave radiometer and U.S. Air Force Data Acquisition and Processing Program infrared data. The temperature-humidity infrared radiometer (6.7 micron and 11 micron) showed the height and spatial configuration of frontal clouds along the east coast and outlined the confluence of a polar jet stream with a broad subtropical jet stream along the U.S. Gulf Coast. Temperature profiles from three vertical temperature sounders are found to be in good agreement with related radiosonde ascents along orbit 569 from the subtropics to the Arctic Circle. Author

N75-17912*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE 25-MB SOUNDING DATA AND SYNOPTIC CHARTS FOR NASA'S AVE 2 PILOT EXPERIMENT
James R. Scoggins and Robert E. Turner Washington Jan. 1975 535 p refs
(NASA-TN-D-7832; M-135) Avail: NTIS HC $12.50 CSCL 04B

Rawinsonde data were tabulated at 25-mb intervals from the surface to 25 mb for the 54 stations participating in the atmospheric variability experiment 2 Pilot Experiment which began at 12 Greenwich mean time on May 11 and ended at 12 Greenwich mean time on May 12, 1974. Soundings were made at 3 hour intervals. Methods of processing and data accuracy are discussed, and synoptic charts prepared from the data are presented. The area covered by the sounding stations is the eastern United States east of approximately 105 deg west longitude. Author

N75-17913# Comitato Nazionale per l'Energia Nucleare, Saluggia (Italy).
THE 1973 METEOROLOGICAL YEARBOOK OF THE EUREX SITE AT SALUGGIA
Apr. 1974 80 p refs In ITALIAN
(RT/PROT-(74)13) Avail: AEC Depository Libraries HC $7.00

The observed atmospheric phenomena and climatological methods applied, with emphasis on the salient features of the meteorological year 1973, are described. Author

N75-17914# Stockholm Univ. (Sweden). Inst. of Meteorology.
EXPERIENCES FROM NUMERICAL FORECASTING WITH THE PRIMITIVE MULTILAYER PREDICTION MODEL AT MISU
Harald Lejenaes 7 Oct. 1974 56 p refs Sponsored in part by Swed. Mil. Weather Serv.
(Contract SWEDSRC-G-0223-058)
(DM-12; Rept-1974-10-07) Avail: NTIS HC $4.25

The primitive multilayer prediction model is tested and compared with experimentally developed data. Forecasts are made with the same weather situation as initiated data. Various physical processes are incorporated and the horizontal resolution is varied; resulting forecasts are compared with the reality as well as with each other. In the comparison, attention was focused upon the speed and the intensity of a small scale cyclon passing over Scandinavia, together with the predicted amount of precipitation and its distribution. Author (ESRO)

N75-17915# Royal Netherlands Meteorological Inst., De Bilt.
YEARBOOK A, NUMBER 125: METEOROLOGY, 1973
May 1974 76 p In DUTCH and ENGLISH Submitted for publication
(KNMI-97-125) Avail: NTIS HC $4.75; Roy. Neth. Meteorol. Inst. F17.50

Results of climatological and meteorological observations in the Netherlands during 1973 are presented in tabular form. Data include air pressure, wind direction, wind velocity, temperature, relative humidity, vapor pressure, global radiation, sunshine, amount of precipitation, and duration of precipitation. ESRO

N75-17916# Royal Netherlands Meteorological Inst., De Bilt.
METEOROLOGICAL AND OCEANOGRAPHIC OBSERVATIONS ON BOARD NETHERLANDS LIGHTVESSELS IN THE NORTH SEA, VOLUME 22, 1970
7 Jun. 1974 186 p In DUTCH and ENGLISH
(KNMI 141 22) Avail: NTIS HC $7.00; Roy. Neth. Meteorol. Inst. F13

North Sea meteorological and oceanographic observations during 1970 are presented in tabular form. Meteorological data include air pressure, air temperature and wet bulb temperature, seawater temperature, amount of precipitation, duration of precipitation and fog. Oceanographic data include salinity, swell, and sea currents. ESRO

N75-17917# Hawaii Univ., Honolulu. Dept. of Meteorology.
MONSOONAL INFLUENCES ON THE ANNUAL VARIATION OF TROPICAL CYCLONE DEVELOPMENT
Colin S. Ramage Aug. 1974 36 p refs
(Contract N66314-73-C-1375; WF52551713)
(AD-A000088; UHMET-74-5;
ENVPREDRSCHF-Tech-Paper-12-74) Avail: NTIS CSCL 04/2

Tropical cyclones developing over the oceans in troughs located at high enough latitudes for westerly winds to be observed on their equatorial sides are discussed. It was found that (1) these near-equatorial troughs coincide with areas of maximum sea-surface temperature, and resemble continental heat troughs, (2) oceanic near-equatorial troughs follow the march of the sun, and (3) the farther they are from the equator the more often do tropical cyclones form in them. Their north-south or meridional rate of movement depends on the rate of ocean surface heating. It is shown that oceanic near-equatorial troughs more than 5 degrees latitude from the equator satisfy most of the prerequisites for tropical cyclone development. Because tropical cyclones cool the sea surface, time and space intervals between tropical cyclone developments seem to be inversely related. Author

N75-17918# Weather Squadron (12th), Ent AFB, Colo.
MAP TYPE CATALOG FOR THE SPAIN WINDOW
Robert C. Sabin, Richard L. Nieman, and Hal W. Wold Aug. 1974 174 p refs
(AD-A000412; Rept-12WS-TP-74-8) Avail: NTIS CSCL 04/2

A standardized procedure has been developed to determine the synoptic map types which have occurred over a specified area (window). The map type catalog is a summarization of information relating to these map types for a particular window. (There is a catalog for each of the 14 United States windows, 3 European windows, and 3 Asian windows.) The catalog includes characteristics of the map types and listings of each map in the data base (25 years of surface pressure maps) along with its most similar map type. Author (GRA)

N75-17919# Weather Squadron (12th), Ent AFB, Colo.
MAP TYPE CATALOG FOR THE JAPAN WINDOW
Robert C. Sabin, Richard L. Nieman, and Hal W. Wold Sep. 1974 163 p refs
(AD-A000411; Rept-12WS-TP-74-9) Avail: NTIS CSCL 04/2
For abstract, see N75-17918.

N75-17920# Weather Squadron (12th), Ent AFB, Colo.
MAP TYPE CATALOG FOR THE KOREA WINDOW
Robert C. Sabin, Richard L. Nieman, and Hal W. Wold Oct. 1974 187 p refs
(AD-A000410; Rept-12WS-TP-74-10) Avail: NTIS CSCL 04/2
For abstract, see N75-17918.

N75-17921# Environmental Prediction Research Facility (Navy), Monterey, Calif.
AN EVALUATION OF THE HARBORS OF KAOHSIUNG AND CHILUNG (KEELUNG), TAIWAN AS TYPHOON HAVENS
Michael E. Brown Apr. 1974 110 p refs
(AD-A000267; ENVPREDRSCHF-Tech-Paper-6-74) Avail: NTIS CSCL 04/2

The study is an evaluation of Kaohsiung and Chilung harbors as typhoon havens. Characteristics of the harbors discussed include moorings, facilities available, wind and wave action, storm surge and the topographical effects on winds prior to and during the passage of tropical cyclones. Problems to be considered if remaining in port and possible evasion procedures for ships sailing from the ports are examined. (Modified author abstract) GRA

N75-17922# Stanford Research Inst., Menlo Park, Calif. Atmospheric Sciences Lab.

DETERMINATION OF ENERGETIC CHARACTERISTICS OF URBAN-RURAL SURFACES IN THE GREATER SAINT LOUIS AREA Final Report
W. F. Dabberdt and P. A. Davis Apr. 1974 109 p refs
(Contract EPA-68-02-1015)
(PB-237704/2; EPA/650/4-74-007) Avail: NTIS HC $5.25 CSCL 04B

The role of surface geophysical characteristics in the partitioning of energy at the complex and heterogeneous metropolitan earth-air interface has been evaluated through a unique application of Lettau's climatonomy theory. The climatonomical methodology permits the determination of the surface descriptors in the basis of the observed diurnal response of the surface to the observed forcing function of available solar energy. Features of various land use types can then be evaluated in the context of the surface energy budget. GRA

N75-17923# Naval Postgraduate School, Monterey, Calif.
AN OBJECTIVE TECHNIQUE FOR ESTIMATING LARGE SCALE FLOW PATTERN IN THE TROPICAL UPPER TROPOSPHERE FROM DIGITIZED CLOUD BRIGHTNESS DATA M.S. Thesis
Frederick T. Jacobs Sep. 1974 59 p refs
(AD-A001252) Avail: NTIS CSCL 04/2

An objective technique is proposed to use digitized satellite cloud brightness data to estimate large-scale flow patterns over data-void tropical regions. It is basically a diagnostic model which assumes: (1) area-averaged cloud brightness is positively correlated with large-scale divergence in the tropical upper troposphere; and (2) large-scale tropical flow is quasi-barotropic and quasi-non-divergent. It can be used at any upper level where divergence is important in determining vorticity. The model requires: (1) boundary conditions determined from surrounding wind reports, (2) a mean zonal flow determined from climatology, and (3) an equivalent divergence forcing function constructed empirically from the brightness data. The technique is tested daily over a western North Pacific region for July-August 1971. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N75-17924 British Library Lending Div., Boston Spa (England).
DISTRIBUTION OF WATER TEMPERATURE ANOMALIES IN THE NORTH ATLANTIC, AS RELATED TO SPECIFIC FEATURES OF THE ATMOSPHERIC MACROPROCESSES
L. Ju. Ryzakov 1974 12 p refs Transl. into ENGLISH from Akad. Nauk Okeanol. (Moscow), v. 4, 1973 p 569-573
(BLL-M-23580-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Charts are constructed showing the typical distribution of water temperature anomaly in the North Atlantic in connection with groups of uniform large-scale atmospheric processes lasting 10 months. A relationship is established between the thermal state of the water in the Atlantic and in other oceans lying in the same latitudes and the prevailing forms of atmospheric processes as these develop both in the initial period from August to December, and in the subsequent forecasting period from January to May. The development of a particular form of circulation leads to the formation of different thermal conditions in the North Atlantic, the Barents Sea, the North Sea and the Baltic. For example, when westerly forms of circulation prevail water temperature is below the long-term norm in the North Atlantic ice, whereas thermal conditions in the North Sea and the Baltic are milder than those found on average. Our assessment of the validity of these forecasting links indicates that they may be used in practice to forecast thermal conditions in the North Atlantic and the seas concerned. Author

N75-17925# Joint Publications Research Service, Arlington, Va.
SOVIET OCEANOGRAPHIC STUDIES
16 Jan. 1975 15 p refs Transl. into ENGLISH from Okeanol. (Moscow), v. 14, no. 4, 1974 p 730-735, 743-745
(JPRS-63899) Avail: NTIS HC $3.25

Studies on automatic date gathering systems for ships in marine geophysical research are reported. For individual titles, see N75-17926 through N75-17927.

N75-17926 Joint Publications Research Service, Arlington, Va.
OCEANOGRAPHIC VERSION OF THE SEISMIC REFLECTED WAVE METHOD
L. I. Kogan, L. R. Merklin, and G. B. Udintsev *In its* Soviet Oceanog. Studies (JPRS-63899) 16 Jan. 1975 p 1-7 refs Transl. into ENGLISH from Okeanol. (Moscow), v. 14, no. 4, 1974 p 730-735 (For availability see N75-17925 09-48)

A study is made of an automated data gathering system for ships. The system is used to create an oceanographic version of the reflected wave method distinguished by high reproducibility, reliability, great depth of investigation, and high informativeness. Author

N75-17927 Joint Publications Research Service, Arlington, Va.
IMPROVING THE INTERFERENCE-FREE OPERATION OF SONIC DEPTH FINDERS
Ye. V. Verzhbitskiy, L. R. Merklin, V. F. Kanayev, and Yu. V. Brylenko *In its* Soviet Oceanog. Studies (JPRS-63899) 16 Jan. 1975 p 8-11 refs Transl. into ENGLISH from Okeanol. (Moscow), v. 14, no. 4, 1974 p 743-745 (For availability see N75-17925 09-48)

The urgency of the problem of automating data gathering and input to a computer in marine geophysical research is noted. The necessity for increasing the signal/noise ratio at the input of the sonic depth finder receiver to insure accurate conversion of depth to digital code is substantiated. A study is made of the problems of applying towed receiving antennas to separate the echoes under difficult meteorological conditions. Author

N75-17928# Waterloopkundig Laboratorium, Delft (Netherlands).
SOME HYDRODYNAMICAL ASPECTS OF GRAVITY-TYPE PLATFORM DESIGN
J. vanderWeide Mar. 1974 17 p refs Presented at the Inter Ocean 1973 Conf., Duesseldorf, 13-18 Nov. 1973
(Publ-120) Avail: NTIS HC $3.25

A review of techniques available to determine water wave forces on offshore production platforms is presented. The potential theory can be used to compute wave forces on large objects with both circular and square cross sections. A set of graphs is given to facilitate the application of this theory, enabling wave loads in both regular and irregular waves to be computed. Horizontal forces for piles with both circular and square cross sections, as obtained from the graphs, are in good agreement with values measured in model experiments. ESRO

N75-17929# Waterloopkundig Laboratorium, Delft (Netherlands).
LINEAR WAVE PROPAGATION PROBLEMS AND THE FINITE ELEMENT METHOD
J. C. W. Berkhoff Mar. 1974 31 p refs Presented at the Intern. Symp. on Finite Element Methods in Flow Probl., Swansea, Engl., 7-11 Jan. 1974
(Publ-124) Avail: NTIS HC $3.75

Mathematical models based on the finite element method are described for linear water waves, in order to obtain quantitative or qualitative information about the effects of waves on structures or harbors. The main restriction of the models is the numerical requirement of about five computing points over one wavelength to compute the potential function with an accuracy of roughly 5%. For the combined refraction-diffraction model this requirement is a rigid one with respect to computer time and storage in the case of a large area compared with the mean wavelength. However, it is possible to divide the whole area of interest into subareas for which different models can be applied and to join the different solutions in an appropriate way. ESRO

N75-17930# Hawaii Inst. of Geophysics, Honolulu.
ELECTRIC FIELDS INDUCED BY STEADY OCEAN CURRENTS
Robert R. Harvey and Lester Q. Spielvogel Sep. 1971 27 p ref Prepared in cooperation with National Oceanic and Atmospheric Administration, Honolulu, Hawaii
(Contract N00014-70-A-0016-0001)
(AD-785285; HIG-74-8; NOAA-JTRE-109) Avail: NTIS CSCL 08/3

Oceanic electric fields can be interpreted in terms of an inducing water current moving through the geomagnetic field. The specific relationship between electric field and water current is determined by the conductivity structure and current geometry. Analytical solutions are found for six useful layered conductivity models. The current geometries can be extended to more complex cases by superposition of results. Author (GRA)

N75-17931# Pacific Missile Range, Point Mugu, Calif.
TIDAL AND LUNAR DATA FOR POINT MUGU, SAN NICOLAS ISLAND, AND THE BARKING SANDS AREA DURING 1975
Robert DeViolini 29 Oct. 1974 59 p refs
(AD-A001274; PMR-TP-74-4) Avail: NTIS CSCL 08/3

Basic lunar and tidal data for Point Mugu, San Nicolas Island, and the Barking Sands area during 1975 are provided. The data presented are: (1) Tidal data; (2) times of moonrise and moonset; and (3) times of lunar phases. GRA

N75-17932# University of South Florida, Tampa. Dept. of Geology.
COASTAL DYNAMICS ON CEDAR ISLAND, VIRGINIA
Richard A. Davis, Jr. and William T. Fox 1 Jun. 1974 73 p refs
(Contract N00014-69-C-0151; NR Proj. 388-092)
(AD-A001068; TR-11) Avail: NTIS CSCL 13/2

A time-series study of coastal processes and morphologic responses was conducted during July, 1973 on Cedar Island, Virginia. Patterns exhibited by variations in monitored environmental variables show interrelationships that are quite comparable to those observed in previous similar studies on Lake Michigan and the central Texas coast. As in previous studies, barometric pressure fluctuations appear to be the key to controlling other processes. Long period swell waves provide the controlling mechanism when they are present in that they cause total wave refraction and no significant longshore currents are present. GRA

N75-17933# California Univ., Los Angeles. Dept. of Geography.
ESTUARINE SEDIMENTATION ALONG THE NATAL COAST, SOUTH AFRICA
Antony R. Orme Aug. 1974 56 p refs
(Contract N00014-69-A-0220-4035; NR Proj. 388-102)
(AD-A000485; TR-5) Avail: NTIS CSCL 08/7

The character and materials of sedimentation in estuaries and lagoons along the 570 km Natal Coast are described and analyzed. Sites examined include the Greater St. Lucia lagoon system with its 9 major contributing rivers, Richards Bay with its 2 main contributing rivers, and 28 rivers that discharge directly into the Indian Ocean without passing through an intermediate lagoonal filtering system other than their own estuaries. Discussion is based on field and remote sensing investigations and borehole data, and is supported by pertinent maps and cross-sections. The nature and processes of sedimentation along the Natal coast are representative of events along more than 2000 km of African coast from central Mozambique to eastern Cape Province. (Modified author abstract) GRA

N75-17726 Joint Publications Research Service, Arlington, Va.
OCEAN FLOOR
N. S. Ageyev, I. B. Andreyeva, V. I. Volovov, Yu. Yu. Zhitkovskiy, S. D. Chuprov, and R. F. Shvachko *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 1-16 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 19-32 (For availability see N75-17725 09-42)

N75-17727 Joint Publications Research Service, Arlington, Va.
SUBSURFACE WAVES
N. S. Ageyev, I. B. Andreyeva, V. I. Volovov, Yu. Yu. Zhitkovskiy, S. D. Chuprov, and R. F. Shvachko *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 17-26 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 57-63 (For availability see N75-17725 09-42)

N75-17728 Joint Publications Research Service, Arlington, Va.
RANDOM NONUNIFORMITIES OF THE OCEAN SERIES
N. S. Ageyev, I. B. Andreyeva, V. I. Volovov, Yu. Yu. Zhitkovskiy, S. D. Chuprov, and R. F. Shvachko *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 27-39 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 63-73 (For availability see N75-17725 09-42)

N75-17729 Joint Publications Research Service, Arlington, Va.
UNDERWATER SOUND CHANNEL
L. M. Brekhovskikh *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 40-71 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 127-154 (For availability see N75-17725 09-42)

N75-17731 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDIES OF THE SOUND FIELD IN THE OCEAN
N. S. Ageyeva *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 82-91 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 202-209 (For availability see N75-17725 09-42)

N75-17732 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL CHARACTERISTICS OF THE SOUND FIELD
N. S. Ageyeva *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 92-112 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 210-227 (For availability see N75-17725 09-42)

N75-17746 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF THE MORPHOMETRIC CHARACTERISTICS OF THE OCEAN BOTTOM AND THE EFFECTIVE REFLECTION COEFFICIENT OF THE SOUND
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 306-327 refs Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 480-486 (For availability see N75-17737 09-42)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N75-17934*# Hardin-Simmons Univ., Abilene, Tex. Microbiology Labs.
RESPONSE OF SELECTED MICROORGANISMS TO EXPERIMENTAL PLANETARY ENVIRONMENTS Semiannual Progress Report, 1 Jul. 1974 - 31 Dec. 1974
Terry L. Foster, Luther Winans, Jr., and Raymond Carroll Casey Jan. 1975 51 p
(Grant NGR-44-095-001)
(NASA-CR-136758; SAPR-5) Avail: NTIS HC $4.25 CSCL 06M

Experiments indicate that hardy organisms will likely grow in the Martian environment if moisture is available, and that these organisms definitely present a threat to contamination of the biopackage if they are transported to the surface of Mars. Author

N75-17935# Naval Aerospace Medical Research Lab., Pensacola, Fla.
A PSYCHOBIOLOGICAL STUDY OF RHESUS MONKEYS EXPOSED TO EXTREMELY LOW FREQUENCY-LOW INTENSITY MAGNETIC FIELDS Medical Research Interim Report
John deLorge 16 May 1974 31 p refs
(MF51524015)
(AD-A000078; NAMRL-1203) Avail: NTIS CSCL 06/18

Communications systems have been shown to produce extremely low frequency (ELF) nonionizing radiation at low intensities. Several studies indicate that radiation within these ranges might have biological effects. The present study contained a number of experiments designed to reveal various behavioral and biochemical changes potentially induced by ELF magnetic fields. Magnetic fields between 8.2 and 0.00093 T alternating at 45 or 15 Hz had no consistent effects on operant behavior

in four rhesus monkeys. No hematological changes were found to relate to the presence or absence of the fields although such changes were related to food deprivation. GRA

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N75-17936# Advisory Group for Aerospace Research and Development, Paris (France).
AN ANTHROPOMETRIC SURVEY OF 2000 ROYAL AIR FORCE AIRCREW, 1970/71
C. B. Bolton (RAE), M. Kenward (Loughborough Univ.), R. E. Simpson (RAE), and G. M. Turner (RAF) Dec. 1974 84 p refs
(AGARD-AG-181; AGARDograph-181) Avail: NTIS HC $4.75

An anthropometric survey of 2000 Royal Air Force aircrew personnel was conducted. Comparisons of means of certain body dimensions are shown for surveys conducted during periods from 1944 to 1971. The apparatus used on the procedures for conducting the measurements are reported. Other subjects discussed include the following: (1) sociological data, (2) the choice of measurements, (3) data recoding and processing, and (4) check measurements. Photographs of subjects being measured are provided. Results of the measurements are tabulated. Author

N75-17937*# Scientific Translation Service, Santa Barbara, Calif.
LIFE IN ORBIT
G. Dimov Washington NASA Feb. 1975 5 p Transl. into ENGLISH from Izv. (USSR), no. 269, 17 Nov. 1974 p 3
(Contract NASw-2483)
(NASA-TT-F-16215) Avail: NTIS HC $3.25 CSCL 06E

A description is given of the Fifth conference of the joint Soviet-American working group on space biology and medicine at Tashkent. Author

N75-17938*# Kanner (Leo) Associates, Redwood City, Calif.
THE REACTION OF THE RESISTIVE AND CAPACITIVE VESSELS OF THE HAND AT THE START OF MUSCULAR EXERCISE
J. M. Verpillat, A. Ghaem, B. Levy, and J. P. Martineaud Washington NASA Feb. 1975 19 p refs Transl. into ENGLISH from J. Physiol. (France), v. 68, Mar. 1974 p 51-64
(Contract NASw-2481)
(NASA-TT-F-16194) Avail: NTIS HC $3.25 CSCL 06P

Heart rate (Fc), arterial blood flow (Q) by hand plethysmography, and variations in venous volume (delta V) were measured in man during muscular exercise of varying levels of exertion (W) from 30 to 180 W. During short-term exercise (5 to 8 minutes), blood flow and volume change in the same way: an initial decrease is followed by a progressive increase. Maximal delta V and minimal Q are not significantly linked with either W or Fc. These results show that the resistive and capacitive vessels of the hand, considered as representatives of cutaneous circulation, may be used as a flow and volume reserve at the beginning of exercise. However, due to the all or nothing type of the observed response it is not possible to attribute a precise regulating function to the cutaneous vessels. Author

N75-17939# International Radiation Protection Association, Washington, D.C.
PROCEEDINGS OF THE THIRD INTERNATIONAL CONGRESS OF THE INTERNATIONAL RADIATION PROTECTION ASSOCIATION.
W. S. Snyder Feb. 1973 798 p refs In various languages Congress held at Washington, D. C., 9-14 Sep. 1973 Sponsored by AEC
(Conf-730907-P1) Avail: NTIS HC $17.25

Abstracts are presented for various papers included at the International Congress of the International Radiation Protection Association. Major topics discussed included the following: (1) radiation perspective in the U.S.; (2) radiation and man; (3) nonionizing radiation; (4) radiation effects on animals; (5) radioecology; (6) metabolism of uranium and transuranium elements; (7) dose calculations; (8) operational health physics. NSA

N75-17940# Battelle Inst., Frankfurt am Main (West Germany).
DECONTAMINATION OF SURFACES CONTAMINATED BY CHEMICAL WARFARE AND THE DECONTAMINATION OF ORGANISMS PENETRATED BY CHEMICAL WARFARE [DEKONTAMINATION VON MIT CHEMISCHEN KAMPFSTOFFEN KONTAMINIERTEN OBERFLAECHEN UND DIE ENTGIFTUNG VON IN ORGANISMEN EINGEDRUNGENEN KAMPFSTOFFEN]
R. Reiner, U. Biehl, and I. Christensen Bonn Bundeswehramt 1974 88 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVG-FBWT-74-6) Avail: NTIS HC $4.75; Bundeswehramt 30 DM

The decontaminating power of 50 compounds towards organofluoro phosphate compounds used in chemical warfare which had penetrated protective clothing, creams, and skin was assayed by determining the kinetics of nucleophylic attack and character of hydrophobic versus hydrophyle. Hydrophobic, nucleophile, negative group substituted oximes and polyoximes, polyhydroxamic acids, hydroguanidine, Schiff bases, hydroperoxides, and antrachinon sulfenic acid were synthesized and reaction rate with dipropylfluoro phosphate was tested with a fluoride sensitive electrode. Dissociation constants in acid solutions were also measured. ESRO

N75-17941# Interuniversitair Reactor Instituut, Delft (Netherlands).
AN ATTEMPT TO BIOSYNTHESIZE Te123-TELLUROMETHIONINE
Z. Kolar 1973 13 p refs Submitted for publication
(IRI-133-73-05) Avail: NTIS HC $3.25

A biosynthetic procedure is described to prepare labelled telluromethionine, similar to the procedure to obtain 75 Se-L-selenomethionine. The latter is widely used in nuclear medicine for the diagnostic visualization of the pancreas by scintigraphy, however it has the disadvantage of resulting in a high radiation dose. The biosynthetic procedure employed is based on the use of baker's yeast. Results indicate that the procedure cannot be applied for the preparation of significant amounts of labelled telluromethionine. Other mechanisms, rather than the incorporation of tellurium into amino acids and proteins, are responsible for the major part of the observed uptake of tellurium by growing yeast. ESRO

N75-17942# Naval Aerospace Medical Research Lab., Pensacola, Fla.
SOME EFFECTS OF ALCOHOL ON VARIOUS ASPECTS OF OCULOMOTOR CONTROL
Fred E. Guedry, Jr., Richard D. Gilson, David J. Schroeder, and William E. Collins 23 Aug. 1974 18 p refs
(MF51525004)
(AD-A000079; NAMRL-1206; USAARL-75-2) Avail: NTIS CSCL 06/16

Recent studies have shown that alcohol interferes with visual control of vestibular nystagmus. The present study was designed to assess three partially independent systems of oculomotor control. Performance on three Tasks was measured before and after mild alcohol dosage. One task involved visual suppression of vestibular nystagmus; a second involved smooth oculomotor tracking of a moving target; and a third required repetitive rapid voluntary shifts in gaze. Oculomotor control was degraded on the first two tasks with recovery toward the initial performance level 4 hours after drinking. Performance on the third task was not obviously degraded, although it is possible that improvement with practice was retarded. Results are discussed in terms of neurological systems involved and kinds of flight tasks potentially affected. Author (GRA)

N75-17943# National Academy of Engineering, Washington, D.C. Committee on the Interplay of Engineering with Biology and Medicine.
STUDY OF ENGINEERING IN MEDICINE AND HEALTH CARE
Jun. 1974 68 p refs
(Contract PH-43-64-44)

(PB-236883/5; ISBN-0-309-02148-0) Avail: NTIS MF $2.25; HC Avail National Academy of Sciences, Printing and Publishing Office, 2101 Constitution Ave., N. W. Washington, D. C. 20418 CSCL 06B

This is the final summary report which has studied and reported on the role of engineering in the development of medical and biological systems. The volume reports on several parallel studies in bioengineering in medicine. It examines the goals, limitations, and progress in applying technology to the problems of health care, considering such specific aspects of the field as technology transfer, sensory aids, clinical engineering, and government interaction with industry. The report also focuses on the role of the university in responding to health care needs through biomedical engineering. It also summarizes a study of biomedical engineering in foreign countries and present an appraisal of needs in biomaterials research and development. GRA

N75-17944# Pennsylvania Univ., Philadelphia.
EFFECTS OF MICROWAVES: LOCAL HOT SPOT HEATING BY MICROWAVES Final Report, 1 Jan. 1970 - 31 Dec. 1973
Herman P. Schwan 28 Oct. 1974 10 p
(Contract N00014-67-A-0216-0015)
(AD-A001558) Avail: NTIS CSCL 06/18

The report summarizes activities since January 1970. Activities in the laboratory include the following topics: Hot spot studies; field force effects; and biophysical and other principles. GRA

N75-17945# Ohio State Univ. Research Foundation, Columbus.
CARDIOVASCULAR, RENAL AND RESPIRATORY EFFECTS OF HIGH INTENSITY, INTERMEDIATE DURATION, LOW FREQUENCY VIBRATION Interim Report, 1 Jul. 1973 - 31 May 1974
Robert M. Nerem, Robert L. Hamlin, and William D. Schwerin 18 Jul. 1974 34 p refs
(Grant AF-AFOSR-2526-73; OSURF Proj. 3656)
(AD-A000042; OSURF-3656-1; AFOSR-74-1607TR) Avail: NTIS CSCL 06/19

A research program on the influence of high intensity, intermediate duration, low frequency wholebody vibration on the cardiovascular, renal, and respiratory systems has been initiated. During the period June 1, 1973 to May 31, 1974, the major emphasis was on the study of the transport of albumin between blood and the arterial wall. Using 131 I-albumin, a series of in vivo experiments have been carried out at a frequency of 10 Hz and a half-amplitude of 0.635 cm as well as at control conditions. These data indicate an enhancement of albumin uptake in the dog aorta in the presence of vibration and are consistent with the concept of a shear dependent transport process. Measurements of aortic pressure and velocity waveforms and, regional blood flow distribution, have also been carried out. Initial results are presented although these experiments are still in progress. Author (GRA)

N75-17946# School of Aerospace Medicine, Brooks AFB, Tex.
RETINAL SUBTHRESHOLD LASER EXPOSURES: CUMULATIVE EFFECT Final Report, Jan. 1973 - Jan. 1974
James T. Gallagher and William F. MacKenzie Sep. 1974 17 p refs
(AF Proj. 6301)
(AD-A000808; SAM-TR-74-39) Avail: NTIS CSCL 06/18

The possibility of cumulative effect from visible laser radiation was investigated by two methods: Testing for a change in the apparent ED50 after a series of previous subthreshold exposures; histologically examining retinal tissue subjected to various series of subthreshold exposure. Neither method indicated a cumulative effect with a 30-sec interval between doses. Author (GRA)

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N75-17947*# Scientific Translation Service, Santa Barbara, Calif.
ESSAYS ON THE PSYCHOLOGY OF OPERATOR LABOR
Ye. A. Mileryan, ed. Washington NASA Jan. 1975 375 p refs Transl. into ENGLISH of the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 1-309
(Contract NASw-2483)
(NASA-TT-F-16020) Avail: NTIS HC $10.00 CSCL 05J

Psychological factors of operator performance in man machine systems design considerations. For individual titles, see N75-17948 through N75-17958.

N75-17948* Scientific Translation Service, Santa Barbara, Calif.
EMOTIONAL-VOLITIONAL COMPONENTS OF OPERATOR RELIABILITY
Ye. A. Mileryan *In its* Essays on the Psychology of Operator Labor (NASA-TT-F-16020) Jan. 1975 p 3-99 refs Transl. into ENGLISH from the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 5-82 (For availability see N75-17947 09-53)
CSCL 05J

Sensorimotor function testing in a tracking task under stressfull working conditions established a psychological characterization for a successful aviation pilot: Motivation significantly increased the reliability and effectiveness of their work. Their acitivities were aimed at suppressing weariness and the feeling of fear caused by the stress factors; they showed patience, endurance, persistance, and a capacity for lengthy volitional efforts. G.G.

N75-17949* Scientific Translation Service, Santa Barbara, Calif.
DISCUSSION AND THEORETICAL SUMMARIZATION OF THE EXPERIMENTAL DATA
Ye. A. Mileryan *In its* Essays on the Psychology of Operator Labor (NASA-TT-F-16020) Jan. 1975 p 100-143 refs Transl. into ENGLISH from the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 83-119 (For availability see N75-17947 09-53)
CSCL 05J

A summary of research on psychological factors that cause substantial changes in the reliability indicators of an operators work is followed by a conclusion that strong moral-volitional qualities are the basic factors that make the human behavior under conditions of stress effective; emotional subcortical subdominants affect a person's conscious organization and self control in a man machine environment. G.G.

N75-17950* Scientific Translation Service, Santa Barbara, Calif.
ON THE EFFECT OF EMOTIONAL STATES ON OPERATOR THINKING
A. V. Solodkova *In its* Essays on the Psychology of Operator Labor (NASA-TT-F-16020) Jan. 1975 p 143-166 refs Transl. into ENGLISH from the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 119-137 (For availability see N75-17947 09-53)
CSCL 05J

A combination sonic and electrical skin stimuli stress test is reported that is suitable for the psychological selection of individuals to perform operator functions. The behavior of these people is characterized by a fighting spirit, increased work capacity, minimum expenditure of strength and insignificant fatigue. G.G.

N75-17951* Scientific Translation Service, Santa Barbara, Calif.
THE OPERATOR'S EMOTIONAL STABILITY
P. B. Zilberman *In its* Essays on the Psychology of Operator Labor (NASA-TT-F-16020) Jan. 1975 p 167-208 refs Transl. into ENGLISH from the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 139-172 (For availability see N75-17947 09-53)
CSCL 05J

An attempt is made to provide a psychological interpretation of the concept of emotional stability in connection with other psychics qualities of an operator's personality. Emotional stability is understood as a person's capacity to control his emotional state for the purpose of maintaining the necessary level of work performance under extreme stress conditions. By modeling the operator's sensorimotor activity and by comparing the productivity indicators under ordinary conditions with those obtained during work involving an emotional load, the level of emotional stability can be determined. G.G.

N75-17952* Scientific Translation Service, Santa Barbara, Calif.
INCREASING THE RELIABILITY OF LABOR OF RAILROAD ENGINEERS
V. S. Genes and Yu. M. Madiyevskiy *In its* Essays on the Psychology of Operator Labor (NASA-TT-F-16020) Jan. 1975 p 209-225 Transl. into ENGLISH from the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 173-185 (For availability see N75-17947 09-53)
CSCL 05J

It has been shown that the group of problems related to temporary overloads still require serious development with respect to further automating the basic control operation - programmed selection of speed and braking. The problem of systems for warning the engineer about the condition of the unseen track segments remains a very serious one. Systems of hygenic support of the engineer also require constructive development. The problems of ensuring the reliability of work of engineers in periods of low information load, requiring motor acts, can basically be considered theoretically solved. Author

N75-17953* Scientific Translation Service, Santa Barbara, Calif.
OPERATIONAL CALM AND THE OPTIMUM REGULATION OF HUMAN WORKING CAPACITY
Ye. P. Ilin *In its* Essays on the Psychology of Operator Labor (NASA-TT-F-16020) Jan. 1975 p 226-251 refs Transl. into ENGLISH from the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 186-206 (For availability see N75-17947 09-53)
CSCL 05J

Muscle hardness measurements in a squeezing dynamometer test are interpreted for expressions of adjustment effects of the central nervous system in rapid response to a starting signal. It is shown that preliminary muscle tension leads to the transmission of inhibiting proprioceptive impulses to the nervous system centers and that the degree of pre-working changes depends on the individual's typological personality characteristics. Concentration of attention during the pre-working adjustment is considered the primary emotional factor that controls sensorimotor performance. G.G.

N75-17954* Scientific Translation Service, Santa Barbara, Calif.
ATTENTION AND ITS ROLE IN THE OPERATOR'S WORK
O. P. Shvetsov *In its* Essays on the Psychology of Operator Labor (NASA-TT-F-16020) Jan. 1975 p 252-280 refs Transl. into ENGLISH from the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 207-230 (For availability see N75-17947 09-53)
CSCL 05J

A complex attentiometer investigation of the distribution, redirection, and concentration of attention during an operator's work notes the following stages: (1) General attentiveness is still not adequately expressed in the beginning; and (2) operator self-control of actions develops and gradually decreases errors in redirecting and distributing attention. A definite relationship is found between the improvement of concentration, distribution and redirection of attention and automation of sensorimotor performance. Excercises prove less effective in redirection of attention. G.G.

N75-17955* Scientific Translation Service, Santa Barbara, Calif.
VERBALIZATION AND IMAGERY IN THE PROCESS OF FORMATION OF OPERATOR LABOR SKILLS
V. V. Mistyuk *In its* Essays on the Psychology of Operator Labor (NASA-TT-F-16020) Jan. 1975 p 281-302 refs Transl. into ENGLISH from the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 231-249 (For availability see N75-17947 09-53)
CSCL 05J

Sensorimotor control tests show that mastering operational skills occurs under conditions that stimulate the operator to independent active analysis and summarization of current information with the goal of clarifying the signs and the integral images that are a model of the situation. Goal directed determination of such an image requires inner and external speech, activates and improves the thinking of the operator, accelerates the training process, increases its effectiveness, and enables the formation of strategies in anticipating the course of events. Author

N75-17956* Scientific Translation Service, Santa Barbara, Calif.
CERTAIN ASPECTS OF THE PSYCHOLOGICAL ANALYSIS OF PROGRAMMER ACTIVITY
V. M. Bondarovskaya *In its* Essays on the Psychology of Operator Labor (NASA-TT-F-16020) Jan. 1975 p 303-334 refs Transl. into ENGLISH from the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 250-275 (For availability see N75-17947 09-53)
CSCL 05J

The psychological analysis of programmer activity showed that one of its basic characteristics is the need to employ formal languages. In determining ways of effectively mastering the capacity to write algorithms in the algorithmic language, it is expedient to proceed from its similarity to the living languages and the language of mathematical formulas, and to choose certain psychological principles of mastering foreign languages and mathematical symbols in teaching the algorithmic language. General models of the input language significantly increase the effectiveness of its mastery and permit the development of thinking on the part of the students. Author

N75-17957* Scientific Translation Service, Santa Barbara, Calif.
THE REACTION OF THE CARDIO-VASCULAR AND SYMPATHICO-ADRENAL SYSTEMS TO INTELLECTUAL ACTIVITY WITH EMOTIONAL STRESS
L. I. Tomashevskaya *In its* Essays on the Psychology of Operator Labor (NASA-TT-F-16020) Jan. 1975 p 335-351 refs Transl. into ENGLISH from the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 275-290 (For availability see N75-17947 09-53)
CSCL 05J

The effect of emotiogenic factors on an operator's intellectual activity were studied for differing working regimes on an experimental control panel that provided for light, sonic, and electrocutaneous stimuli. The latter stimulus was activated automatically if the subject gave an incorrect response. It was shown that the working capacity of the operator under stress depends to a great extent on the effect of the emotiogenic factors on the individual functioning characteristics of the cardiovascular and sympathetic-adrenal systems. Moral, intellectual, willpower, emotional, and other personality traits are decisive factors of operator function. G.G.

N75-17958* Scientific Translation Service, Santa Barbara, Calif.
THE PSYCHOLOGICAL CERTIFICATE OF THE COMPUTER
Ye. A. Mileryan *In its* Essays on the Psychology of Operator Labor (NASA-TT-F-16020) Jan. 1975 p 352-372 ref Transl. into ENGLISH from the book "Ocherki Psykhologii Truda Operatora" Moscow, Nauka Press, 1974 p 290-307 (For availability see N75-17947 09-53)
CSCL 05J

A systems structural approach is reported to study the operator for a computerized man machine system psychologically in order to obtain relative estimates for his performance in the particular system he serves. Considered are the reliability of sensorimotor control functions for the reconstructed system and its indices according to the level of effectiveness of the operator's accomplishment of intellectual operations. G.G.

N75-17959# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
COLD REGIONS HABITABILITY: A SELECTED BIBLIOGRAPHY
C. Burgess Ledbetter Sep. 1974 30 p
(DA Proj. 4A1-62121-A-894)
(AD-A000692; CRREL-SR-211) Avail: NTIS CSCL 05/5

The effects on people of isolation and confinement in man-made structures in cold regions, commonly termed cabin fever, also occur in other environments, such as spacecraft, underwater vessels, and elements of the urban environments such as hospitals and prisons. Habitation characteristics of cold regions are discussed and literature dealing with a variety of types of isolation and confinement environments is segregated into topical areas. Author (GRA)

N75-17960# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF BIORHYTHMIC INFLUENCE UPON HUMAN PERFORMANCE M.S. Thesis

John Edward Mosier Sep. 1974 39 p refs
(AD-A001266) Avail: NTIS CSCL 06/16

The research attempted to define the relationship between actual performance and the state of the biorhythm. Seven subjects performed two physical tasks, one measuring gripping force and the other measuring time-on-target. Performance was compared to each of the individual biorhythm cycles and also to various combinations of the cycles. The results suggested that some functional relationship may exist. Evidence was presented supporting the concept of relativity in biorhythmic influence among individuals. GRA

N75-17961# Naval Postgraduate School, Monterey, Calif.
PILOT ACCIDENT POTENTIAL AS RELATED TO TOTAL FLIGHT EXPERIENCE AND RECENCY AND FREQUENCY OF FLYING M.S. Thesis
Henry Benjamin Myers, Jr. Sep. 1974 79 p refs
(AD-A001256) Avail: NTIS CSCL 05/9

The thesis introduces exploratory data analysis methods into the question of categorizing pilots and relating these categories to accident potential. The usually recorded flight data deal with the pilots' total flight experience, recency, and frequency of flying. The purpose of categorizing is to determine if the recorded flight data could help discriminate between two original sample groups of fifty pilots each, those pilots with accidents during FY73 and those without. The technique of linear discriminant analysis indicated that there is significant difference in the mean vectors of flight data for the two groups. (Modified author abstract) GRA

N75-17962# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
THE HUMAN PILOT AS A DYNAMIC ELEMENT IN AIRCRAFT CONTROL SYSTEMS Final Report
Thomas B. Willen Apr. 1974 44 p refs
(AD-A001622; ASD-TR-73-47) Avail: NTIS CSCL 01/3

A great deal of research has been devoted to the development of a human pilot describing function model for single axis compensatory tracking tasks and as a result the model has shown good repeatability in predicting pilot behavior. The extension of the single axis model to the more pragmatic multiloop control situation is somewhat tentative at present but does not seem to be an unreasonable extrapolation. Application of the pilot model to the development of a flexible and objective handling qualities theory holds real promise; however, further definition of the subjective pilot opinion rating - pilot model parameter link is required. A beneficial approach along these lines would be flight testing for pilot behavior characteristics in all new or existing aircraft weapons systems. An alternate approach to the pilot modeling is the sampled-data model and certain control situations warrant its use. The sample remnant model discussed may provide a suitable matching of approaches with more research. GRA

N75-17963# Office of the Chief of Research Development and Acquisition (Army), Washington, D.C.
PROCEEDINGS OF CONFERENCE ON AIRCREW PERFORMANCE IN ARMY AVIATION Final Report
Jul. 1974 205 p refs Held at Fort Rucker, Ala., 27-29 Nov. 1973
(AD-A001539) Avail: NTIS CSCL 01/2

The purpose of the conference was to explore the behavioral problems affecting pilots of Army helicopters, with special emphasis on Nap-of-the-Earth (NOE) flight. The technical papers included in this Proceedings deal with the nature of the future combat environment, next generation helicopters, cockpit configuration, map aids, avionics systems, night vision devices, training and simulation requirements and measurement criteria. Included also is a recommended behavioral research program to support Army Aviation. GRA

N75-17964# New Mexico State Univ., University Park. Dept. of Psychology.
QUANTITATIVE MODELS FOR PREDICTING HUMAN VISUAL/PERCEPTUAL/MOTOR PERFORMANCE Final Report
Warren H. Teichner Oct. 1974 47 p refs
(Contract N00014-70-A-0147-0002; NR Proj. 197-013)
(AD-A001072; NMSU-ONR-TR-74-3) Avail: NTIS CSCL 05/10

The report provides an integration of the work performed under the contract along with related developments in the field. The report begins with a general definition of a task. It then develops a theoretical approach for the prediction and evaluation of task performance. Following that, specific task definitions are derived from the theory and the manner of their application explained. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N75-17965*# Telecare Inc., Houston, Tex.
ADVANCED LIFE SYSTEMS HARDWARE DEVELOPMENT FOR FUTURE MISSIONS Final Report
Jan. 1975 65 p refs
(Contract NAS9-13603)
(NASA-CR-141625) Avail: NTIS CSCL 06K

An examination of the pulse formation in an externalized vessel suggests that the vessel does not behave as a simple visco-elastic tube. Pressure-pulse waveform transducers are sensitive either to the pressure present at the vessel wall or to the volume of blood filling a region of tissue. Results of comparisons between intra-and extra-vascular pressure recordings suggest that changes in vasomotor tone and transducer-vessel pressures may be the greatest contributors to the divergence of extra-vascular waveforms from intra-vascular waveforms. M.C.F.

N75-17966*# McDonnell-Douglas Astronautics Co., Houston, Tex.
CREW PROCEDURES DEVELOPMENT TECHNIQUES Final Report
J. D. Arbet, R. L. Benbow, M. L. Hawk, A. A. Mangiaracina, J. L. McGavern, and M. C. Spangler 3 Jan. 1975 41 p refs
(Contract NAS9-13660)
(NASA-CR-141592; MDC-E1196) Avail: NTIS HC $3.75 CSCL 05E

The study developed requirements, designed, developed, checked out and demonstrated the Procedures Generation Program (PGP). The PGP is a digital computer program which provides a computerized means of developing flight crew procedures based on crew action in the shuttle procedures simulator. In addition, it provides a real time display of procedures, difference procedures, performance data and performance evaluation data. Reconstruction of displays is possible post-run. Data may be copied, stored on magnetic tape and transferred to the document processor for editing and documentation distribution. Author

N75-17967*# URS/Matrix Co., Houston, Tex. Life and Environmental Sciences Div.
DEVELOPMENT OF AN EVA SYSTEMS COST MODEL VOLUME 1: DESIGN GUIDES SYNOPSIS-EVA EQUIPMENT Final Report
Jul. 1974 219 p refs
(Contract NAS9-13790)
(NASA-CR-141634) Avail: NTIS HC $7.25 CSCL 06K

EVA equipment design guides and crewman interfaces are provided. A summary presents data on suited crewman mobility capabilities and on off-the-shelf Skylab hardware for economy planning. Author

N75-17968# Civil Aeromedical Inst., Oklahoma City, Okla.
EAR-PROTECTOR RATINGS
Jerry V. Tobias and F. Michael Irons Dec. 1973 19 p refs
(AD-779552; FAA-AM-73-20) Avail: NTIS HC $3.00

Ear protectors, including custom-molded, wearer-molded, and pre-molded types, were evaluated according to American-standard procedures. Earplugs are described and are listed in the order of their low-frequency (below 1000 Hz) attenuation. Author

N75-17969*# Walden Research Corp., Cambridge, Mass.
CONTAMINANT REMOVAL FROM ENCLOSED ATMOSPHERES BY REGENERABLE ADSORBENTS Final Report
Robert L. Goldsmith, Kenneth J. McNulty, Gerald M. Freedland, Amos Turk (City Coll. of the City of New York), and Jerry Nwankwo (City Coll. of the City of New York) 15 May 1974 91 p refs (Contract NAS2-7896)
(NASA-CR-137626) Avail: NTIS HC $4.75 CSCL 06K

A system for removing contaminants from spacecraft atmospheres was studied, which utilizes catalyst-impregnated activated carbon followed by in-situ regeneration by low-temperature catalytic oxidation of the adsorbed contaminants. Platinum was deposited on activated carbon by liquid phase impregnation with chloroplatinic acid, followed by drying and high-temperature reduction. Results were obtained for the seven selected spacecraft contaminants by means of three experimental test systems. The results indicate that the contaminants could be removed by oxidation with very little loss in adsorptive capacity. The advantages of a catalyst-impregnated carbon for oxidative regeneration are found to be significant enough to warrent its use. Author

N75-17970# Ben Gurion Univ. of the Negev, Beersheva (Israel). Dept. of Mechanical Engineering.
A SIMULATION OF AN AIRCRAFT'S ENVIRONMENTAL CONTROL SYSTEM
Yaacov Eichler 7 Mar. 1974 30 p refs Backup document for AIAA Synoptic, "A Simulation Study of an Aircraft's Environment Control System Dynamic Response", scheduled for publication in the Journal of Aircraft in Aug. 1975
Avail: NTIS HC $3.75

A simulation was made of the environmental control system (ECS) of a high performance aircraft. The ECS provides temperature control for the cockpit and avionics equipment bays throughout the flight performance envelope of the aircraft. This is achieved by bleeding hot air from the engine, cooling part of it and mixing the hot and cold flows. The sensors, controller and valves of the system were modelled as well as the heat exchangers and expansion turbine. Dynamic response was compared to specifications and sensitivity of performance to system parameters was measured. A partial evaluation of the simulation was achieved by using some available laboratory test results and comparing these with simulation results for the same conditions. Author

N75-17971*# Life Systems, Inc., Cleveland, Ohio.
HYDROGEN DETECTION STUDY Final Report, 1 Jan. - 30 Sep. 1974
J. W. Shumar and J. D. Powell Sep. 1974 49 p refs (Contract NAS2-6478)
(NASA-CR-137563; LSI-ER-170-85) Avail: NTIS HC $3.75 CSCL 06K

The effectiveness was assessed of a hydrogen (H2) detection concept for regenerative environmental control life support systems (EC/LSS). The concept evaluated was that utilized for the electrochemical depolarized concentrator (EDC) design, constructed, and tested for the EC/LSS space station prototype program. The EDC contains combustible gas detectors (CGDs) which were evaluated with H2. The CGDs were evaluated for linearity, position sensitivity, reproducibility, ambient effects, repeatability, speed of response, recovery time, and interchangeability. The effectiveness of CGDs located within the EDC for sensing H2 leaks at various line replaceable units in the subsystem was determined. The effects of H2 leak rate, H2 concentration of leaking gas and air currents in the vicinity of the EDC were determined. Proposed improvements for the H2 detection concept were documented and alternative H2 detection approaches were identified and analyzed. Author

N75-17972*# Acurex Corp., Mountain View, Calif.
PHASE 2, 3 AND 4 8 psi PRESSURE GLOVE Final Report
William Elkins Jan. 1975 76 p
(Contract NAS2-7610)
(NASA-CR-114755; Rept-74-104) Avail: NTIS HC $4.75 CSCL 06K

The feasibility of providing a high pressure, very mobile and reliable space suit glove system is demonstrated. A 'soft' toroidal wrist joint assembly was developed. A representative Kevlar and steel wrist section was tested and proved the useful lifetime to be in excess of 1,000,000 cycles. Improved comfort was accomplished by increasing the first finger metacarpal dimensions. Recommendations concern design refinements, and EVA configuration. Author

N75-17973# Flying Personnel Research Committee, London (England).
EVALUATION OF AIRCREW PROTECTIVE HELMETS WORN DURING CRASHES AND EJECTIONS
D. H. Glaister May 1974 37 p refs Revised
(AD-A000632; FPRC-1330-Rev) Avail: NTIS CSCL 06/17

A method is described for evaluating the impact history of aircrew protective helmets. Of 30 helmets randomly selected it was concluded that 40% had contributed to a reduction in head injury and had probably been life saving. There was a reasonable correlation between estimated impact energy and head injury, but that between estimated transmitted force and head injury was less satisfactory, presumably due to the non-representative dynamic behaviour of current headforms. Author (GRA)

N75-17974# Whittaker Corp., Waltham, Mass. Space Sciences Div.
DEVELOPMENT OF AN IMPLANTABLE OXYGEN SENSOR. IN VITRO VALIDATION OF THE FUEL CELL OXYGEN SENSOR IN REAL AND SIMULATED BODY FLUIDS Annual Report, Jun. 1973 - Jun. 1974
Kuo wei Chang and Sol Aisenberg Jun. 1974 61 p refs (Contract N01-HL-3-3033-R)
(PB-237373/6; SSD-P-708-AR-1) Avail: NTIS HC $4.25 CSCL 06B

An implantable oxygen sensor for continuous measurement of blood oxygen tension was devised which is a specially designed glucose fuel cell operating in the oxygen-diffusion limited mode where the short circuit current is directly proportional to the dissolved oxygen concentration of the surrounding fluid. In vitro measurements in glucose containing Krebs-Ringer solutions and in bovine serum show that the sensor is linear, accurate, stable, and fast responding. Two prototype sensors were described, one being composed of porous electrodes and the other of wire cathode and porous anode. Both prototype sensors were miniaturized and are ready for trial in animals. GRA

N75-17975# McDonnell-Douglas Corp., Huntington Beach, Calif.
REVERSE OSMOSIS FOR SPACECRAFT WASH WATER RECYCLING MEMBRANE COUPON AND MODULE EVALUATIONS Progress Report
G. W. Wells and R. E. Shook Jul. 1974 169 p refs (Contract DI-14-30-3062)
(PB-236941/1; INT-OSW-RDPR-74-994) Avail: NTIS HC $6.25 CSCL 07A

The investigation and evaluation of reverse osmosis membrane coupons are presented, and the testing of an 80 gallon per day blend cellulose di- and tri-acetate spiral wound module for spacecraft wash water recycling is discussed. Tests were conducted on five membrane materials using a 165F simulated spacecraft wash water solution feed at first 800 and then 500 psig. The five membrane materials tested were: composite coated polysulfone film, cellulose acetate composite, sulfonated polysulfone, ethyl cellulose, and plasma polymerized amine polysulfone. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N75-17976 British Library Lending Div., Boston Spa (England).
STRUCTURE OF CONTROL COMPUTERS FOR SWITCHING SYSTEMS
E. V. Konovalov, V. G. Lazarev, N. P. Mareicheva, A. I. Sapozhkov, and G. I. Shapkovskii 4 Feb. 1974 20 p Transl. into ENGLISH of the book "Avtomaty i Upravlyeniye Setyami Svyazi" Moscow, Izd. Nauka, 1971 p 17-28
(BLL-Trans-2931-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

Structure for a switching system control computer (YMKC/UMKS) is presented. It is shown that the agregate-block principle of constructing UMKS, compared with the model and multi-machine principles, can satisfy functional and capacity requirements as well as operational. The characteristics of the accepted variant of UMKS are: presence of multiprocessors and specialized processors, programmed control of instruction of timing structure, storage accessibility, and elimination of special means of linking the processors with the switching apparatus. Author

N75-17977# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).
MCDATA CODE
M. Cosimi Apr. 1974 21 p refs
(RT/FI-(74)19) Avail: AEC Depository Libraries HC $4.25

The MCDATA code provides the capability of handling in an automatic way cross section data sets generated by successive runs of the MC squared code. Different retrieval options are provided, and the resulting libraries are organized in the formats required by many neutronics codes of general use in fast reactor design calculations. Author (NSA)

N75-17978# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AUTOMATED SYSTEM FOR THE CONTROL OF DIGITAL MODULES OF COMPUTERS
D. M. Grohman and B. G. Sergeev 11 Oct. 1974 26 p refs Transl. into ENGLISH from Upravlyayushchie Sistemy i Mashiny (USSR), no. 1, Jan./Feb. 1973 p 86-93
(AD-A000180; FTD-MT-24-1633-74) Avail: NTIS CSCL 09/2

The system examined in the article is able to insure effective control and diagnostics of the failures of modules and assemblies by means of digital computer technology. It makes it possible to substantially reduce the expenditures of preparation time of information necessary for control, to accelerate by many times the process of control, to standardize the procedures and the means of control during the production and operation of TsU. The use of the system described during the development and production of one of the first Soviet computer complexes of the third generation (M-4,000 ASVT) showed its high effectiveness. GRA

N75-17979# Syracuse Univ., N.Y. Dept. of Electrical and Computer Engineering.
A SURFACE FORMULATION FOR CHARACTERISTIC MODES OF MATERIAL BODIES
Yu Chang and Roger F. Harrington Oct. 1974 126 p refs
(Contract N00014-67-A-0378-0006; NR Proj. 371-885)
(AD-A000285; TR-74-7; TR-2) Avail: NTIS CSCL 20/14

A theory of characteristic modes for material bodies is developed using equivalent surface currents, which is in contrast to the alternative approach using induced volume currents. The characteristic modes of material bodies have most of the properties of those for perfectly conducting bodies. Formulas for the use of these modes in electromagnetic scattering problems are given. A procedure for computing the characteristic modes is developed, and applied to two-dimensional bodies. Illustrative examples of the computation of characteristic currents and scattering cross sections are given for cylinders of different material constants. Author

N75-17980# White Sands Missile Range, N.Mex. Data Reduction and Computing Group.
AUTOMATIC DATA COLLECTION AND DATA ENTRY TECHNIQUE; DR/CG SEMINAR (2ND) Final Report
23 Apr. 1974 185 p
(AD-A001556) Avail: NTIS CSCL 09/2

The symposium covered systems which were interfaced with data from radar, telemetry, optical, and acoustic sensors. The papers given covered almost all phases of data processing including acquisition, collection, data transmission, formatting, storage, retrieval, computation, and data display both in real-time and post-flight modes. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N75-17981*# Houston Univ., Tex. Dept. of Mathematics.
PROGRAM DOCUMENTATION OCM, HISTOG, PRINTUM
Jack Bryant Aug. 1974 37 p
(Contract NAS9-12777)
(NASA-CR-141622; Rept-35) Avail: NTIS HC $3.75 CSCL 09B

The One Channel Map (OCM) program is described as a program which fills the need for better quality reproduction of digital pictures on high-speed printers. The method, program variables, and usage are presented. Flow charts and a sample run are included for the OCM. F.O.S.

N75-17982*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ORBITAL FLUX INTEGRATIONS: PARAMETER VALUES FOR EFFECTIVE COMPUTER TIME REDUCTIONS
E. G. Stassinopoulos Nov. 1974 69 p refs Submitted for publication
(NASA-TM-X-70823; X-601-74-349) Avail: NTIS HC $4.25 CSCL 09B

To improve computer utilization and to reduce the cost of orbital flux integrations, the effects of integration parameters 'duration' (T) and 'stepsize' (delta t) on integration results were investigated. Over given ranges of T and delta t, and within specified acceptable accuracy restraints, optimal values of these parameters were established for circular subsynchronous trajectories, in terms of the variables altitude (H) and inclination (i). It is shown that (1) above a certain statistically important value, duration is independent of both h and i; (2) stepsize has a relative altitude dependence; and (3) stepsize is not a function of inclination. The substantial savings in computer time are discussed along with the possibility of greater savings by relaxing accuracy restrictions while not exceeding the minimum model-associated uncertainty factors of the environments. M.J.S.

N75-17983# Signals Research and Development Establishment, Christchurch (England).
SOFTWARE REQUIREMENTS FOR DEDICATED HIGH INTEGRITY SYSTEMS
J. M. Taylor Mar. 1974 34 p refs
(SRDE-73010; BR41597) Avail: NTIS HC $3.75

A virtual machine approach to specifying and designing software for large, dedicated high integrity systems is introduced.

An example of how this approach can be embodied in a software user requirement suitable for procuring systems at the current state of the art is given. The approach described is based on specifying the interface between applications software and systems software in terms of a standard high level virtual machine which provides all the facilities required or implied by the application source code at all stages of compilation, system building, and run time execution. ESRO

N75-17984# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
THE DIAGNOSTIC FACILITIES IN ALGOL COMPILERS
R. S. Scowen Jul. 1974 33 p refs
(NPL-NAC-52) Avail: NTIS HC $3.75

A number of small programs which can be used to investigate the diagnostic features in a compiler for ALGOL 60 or one of its associated languages or developments is presented and tested on various compilers. Results are given. ESRO

N75-17985# Florida State Univ., Tallahassee. Dept. of Statistics.
AEROSPACE APPLICATIONS OF STOCHASTIC PROGRAMMING, DUELS AS GAMES OF TIMING AND EXPERIMENTAL DESIGN Final Report, 1 Jun. 1973 - 30 Sep. 1974
A. Hedayat 1974 11 p
(Grant AF-AFOSR-2527-73; AF Proj. 9769)
(AD-A000349; AFOSR-73-2527TR) Avail: NTIS CSCL 12/1

The report discusses the following topics: Resistant and susceptible BIB designs; On a measure of aliasing due to fitting an incomplete model; On the theory of connected designs: Characterization and optimality; Repeated measurements designs; On the nonexistence of Knute Vik designs for all even orders; The family of t-designs: Survey and advances; On the theory and application of sum composition of Latin square and orthogonal Latin square designs; A class of continuous nonlinear programming problems; Duels with continuous firing. GRA

N75-17986# Massachusetts Inst. of Tech., Cambridge. Computation Structures Group.
THE RECURSIVE EQUIVALENCE OF THE REACHABILITY PROBLEM AND THE LIVENESS PROBLEM FOR PETRI NETS AND VECTOR ADDITION SYSTEMS
Michel Hack Aug. 1974 12 p refs
(Grant NSF GJ-34671)
(PB-237186/2; CSG-Memo-107) Avail: NTIS HC $3.25 CSCL 09B

A formalism called Vector Addition Systems was introduced to discuss Parallel Program Schemata; Petri Nets was introduced to model concurrent behavior in systems. Both formalisms were used to model and analyze the structural behavior to asynchronous and parallel systems. The Unsolvability of the Inclusion Problem for Reachability Sets in Vector Addition Systems is also discussed. The Liveness Problem is the problem of deciding whether a system could possibly ever reach a deadlocked state from the initial state. The Inclusion Problem, which Rabin has shown to be undecidable is the question of whether one system's set of possible configurations include all possible configurations of another, which is related to whether one system can simulate another. GRA

N75-17987# Pattern Analysis and Recognition Corp., Rome, N.Y.
DATA PROCESSING SUPPORT TO LASER PROPAGATION PROGRAM Final Report
Richard A. Jayne and Donald H. Foley Oct. 1974 174 p refs
(Contract F30602-73-C-0369)
(AD-A001089; RADC-TR-74-284) Avail: NTIS CSCL 09/2

The main content of this report deals with the modifications to a FORTRAN computer program used to spectrally analyze two digitally sampled time series. The program was made compatible with RADC's Honeywell 635/645 computer. An addition to the original program was made at RADC. This addition is a GEMAP input routine which rewrites the digitally sampled data. Rewriting the tape was required to eliminate all magnetic tape read errors that would not be handled by the FORTRAN read statement. A description of this program is included in this report. (Modified author abstract) GRA

N75-17988# California Univ., Los Angeles. Western Management Science Inst.
A GUIDED TOUR OF RECENT PRACTICAL ADVANCES IN INTEGER LINEAR PROGRAMMING
Arthur Geoffrion Sep. 1974 18 p refs
(Contract N00014-69-A-0200-4042; Grant NSF GP-36090)
(AD-A000259; WMSI-Working-Paper-220) Avail: NTIS CSCL 12/2

Integer programming has been an extremely active field in recent years both in terms of research and applications. Only a small fraction of the contributions, however, are of demonstrable practical value to practitioners or software designers within the near future. These are the contributions brought into focus here. A guided tour will be taken of important recent developments in the following areas: (1) large-scale linear programming advances useful in integer programming, (2) the subtleties of modeling integer problems so as to achieve truly meaningful and computationally tractable models, (3) algorithmic advances compatible with the branch-and-bound approach, and (4) progress toward badly needed post-optimal reoptimization capability in integer programming. Practical illustrations will be drawn from selected areas of application. Author (GRA)

62 COMPUTER SYSTEMS

Includes computer networks.

N75-17989# Royal Radar Establishment, Malvern (England).
A REVIEW OF INNOVATIVE COMPUTER ARCHITECTURE
R. S. Newton May 1974 33 p refs
(RRE-TN-784; BR42005) Avail: NTIS HC $3.75

A review of current innovations in computer architecture is presented together with a representative selection of abstracts from the literature. The trend in computer system design is towards the use of the associated processes for complex repetitive processing as a peripheral to the main system, continuing development of the fault tolerant system (the coequal multiprocessor being used when there are large data bases, and the federated multiprocessor for control applications) and increasing use of user programmable microprogramming in processor design. ESRO

N75-17990# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
A GUIDE TO THE TIP COMPUTER
H. K. Utterback Sep. 1974 84 p
(Contract N00017-72-C-4401)
(AD-787505; APL-TG-1263) Avail: NTIS CSCL 09/2

The TIP (Transit Improvement Satellite) flight computer is a general purpose machine with specialized input/output logic to service the unique spacecraft functions. This report is a handbook for programming the TIP computer. A description of the registers is followed by a complete explanation of the instruction set. Use of the assembly program, ARTIC, is explained with some coding examples. Use of the computer simulator is also presented with instructions on the basic software, i.e., a bootstrap, a loader, a memory pump, and two diagnostics. Author (GRA)

N75-17991# Stanford Univ., Calif. Electronics Labs.
BALANCED COMPUTER SYSTEMS
Thomas G. Price Apr. 1974 59 p refs
(Contract N00014-67-A-0112-0044)
(AD-A001071; SU-SEL-74-037; SU-STAN-CS-74-435) Avail: NTIS CSCL 09/2

The central server model is used to extend Buzen's results on balance and bottlenecks. Two measures are developed which appear to be useful for evaluating and improving computer system performance. The first measure, called the balance index, is useful for balancing requests to the peripheral processors. The second quantity, called the sensitivity index, indicates which processing rates have the most effect on overall system performance. GRA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N75-17992# Lockheed Missiles and Space Co., Palo Alto, Calif.
METHODS OF CONSTRUCTING LOGIC RECOGNITION SYSTEMS AND METHODS OF ESTIMATING THEIR EFFICIENCY, CHAPTER 6
A. L. Gorelik and V. A. Skripkin [1975] 23 p refs Transl. into ENGLISH from the book "Postroenie Sistem Raspoznavaniia" Moscow, Sovetskoe radio, 1974 p 162-216
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago Ill. 60616

The idea of using an abbreviated basis for recognition systems is extended to logic systems with a large number of elements; the singularities of constructing algorithms for the solution of logic problems and the realization of these algorithms on an electronic computer are shown in specific examples. A general approach to estimating the efficiency of logical object recognition systems and to using the method of statistical tests to find the values of the system efficiency indices is developed. It is shown by the example of constructing a recognition system for weather forecasting how the fundamental ideas and apparatus of logic algebra can be used to establish empirical regularities relating the separate phenomena or processes. The solution of a number of practical problems of the construction and optimization of logical recognition systems is presented. Author

N75-17993# RAND Corp., Santa Monica, Calif.
SOVIET CYBERNETICS REVIEW, VOLUME 4, NO. 4, 1973/74 INDEX Final Report
Wade B. Holland, ed. 1974 19 p
(AD-A001091; R-1500/4) Avail: NTIS MF $2.25; HC $1.00 available from Publications Dept., RAND Corp., 1700 Main St., Santa Monica, Calif. 90406 CSCL 09/2

The publication contains a set of indexes to the final volume of the Rand journal of translations, commentary, and news items on Soviet bloc computers and computing, automatic control, and related subjects. Separate indexes are given for (1) subjects, (2) personalities, including both authors and persons mentioned, (3) organizations, and (4) hardware and software, with photographs and technical specifications indicated. GRA

N75-17994# Stanford Univ., Calif. Dept. of Computer Science.
FIVE LECTURES ON ARTIFICAL INTELLIGENCE
Terry Winograd Sep. 1974 100 p refs
(Contract DAHC15-73-C-0435; ARPA Order 2494)
(AD-A000085; AIM-246; SU-STAN-CS-74-459) Avail: NTIS CSCL 09/2

Contents: Computer systems for natural language; SHRDLU, A system for dialog; Representation, formalisms for knowledge; Frames, some ideas for a new formalism; Conceptual programming, applying artificial intelligence to program writing. GRA

N75-17995# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THEORY OF SIGNAL TRANSMISSION
D. D. Klovskii 19 Sep. 1974 527 p refs Transl. into ENGLISH of the book "Teoriya Peredachi Signalov" Moscow, 1973 p 1-376
(AD-A000111; FTD-HC-23-944-74) Avail: NTIS CSCL 09/4

The basic theorems of the theory of signal transmission are considered along with the principles of the theory of signals and the theory of interference-free reception. Problems of coding are considered, and the most interference-free methods of transmission were determined; the different systems of communications were compared. Author

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N75-17996 Polish Academy of Sciences, Warsaw.
EXISTENCE OF PERIODIC SOLUTIONS AND REDUCIBILITY TO A KdV EQUATION FOR LINEAR DISPERSION SYSTEMS [ISTNIENIE ROZWIAZAN PERIODYCZNYCH I SPROWADZALNOSC DO ROWNANIA KDV DLA UKLADOW NIELINIOWYCH Z DYSPERSJA]
Walter Zielke 3 Apr. 1973 15 p refs In POLISH
(Rept-12/1973) Avail: Issuing Activity

A class of equations was investigated which during small amplitudes are described as Korteweg-deVries equations and simultaneously have density periodic stationary solutions. Included in this class were equations for ionic-acoustic and hydromagnetic waves radiating in cold collisionless plasma. A Lagrange qualification was investigated from which solutions can be obtained for Euler-Lagrange equations. The Whitham method is presented for investigating the modulative stability of nonlinear dispersive waves. Transl. by M.J.S.

N75-17997 Suomalainen Tiedeakatemia, Helsinki (Finland).
ON THE LINEAR ALGEBRAIC STRUCTURE REPRESENTING ONE ELECTRON-POSITRON IN VACUUM
G. Jaernefelt 10 Sep. 1974 56 p refs
(ISBN-951-41-0152-9; Rept-565) Copyright. Avail: Issuing Activity

The special-relativistic quantum theoretical linear algebraic structure describing a free electrical particle, electron-positron with spin, in vacuum is analyzed. A fixed Lorentz-coordinate-system is used as a frame. As starting points, five fundamental analytical number-manifolds were used: a real number-manifold corresponding to the time-coordinate, three real number-manifolds corresponding to the three space-coordinates, and a finite spin-manifold consisting of the numbers 0, 1, 2, 3. These manifolds form the basis of the structures scrutinized. Complete sets of mutually commuting observables within a linear algebraic structure are called x:-sets and give a representation of the operators and the Hilbert-vectors, the kets and the bras, belonging to the structure. The equation of motion or the state-equation of a physical system was solved in various ways by using diverse representations. The average value of the abscissa coordinate was calculated in two ways and as a result Dirac's formula was written in detail in two ways. The notations of Dirac were used throughout. Author

N75-17998 Suomalainen Tiedeakatemia, Helsinki (Finland).
A ZERO-FREE REGION FOR CERTAIN L-FUNCTIONS
Timo Lepistoe 11 Feb. 1974 13 p refs
(ISBN-951-41-0172-3; Rept-576) Copyright. Avail: Issuing Activity

Starting with Dirichlet's L-function L(s,x) in the region 1-b/log k(1 + the absolute value of t) less than or equal to beta, t arbitrary, a value for b (the positive constant) is determined. Since only L-functions modulo an odd prime are needed, the investigation was restricted to the case of k =p and p greater than or equal to 211. M.J.S.

N75-17999 Suomalainen Tiedeakatemia, Helsinki (Finland).
ESTIMATES FOR UNIVALENT FUNCTIONS WITH QUASI-CONFORMAL EXTENSIONS
Zerrin Gokturk 18 Jun. 1974 20 p refs
(ISBN-951-41-0203-7; Rept-589) Copyright. Avail: Issuing Activity

The class is studied of conformal homeomorphisms of the unit disc which are normalized and have k-quasiconformal extensions to the whole plane such that the point at infinity remains fixed. Previous work is summarized, and general inequalities are applied to obtain estimates which are used to study the power series coefficients a sub n of f. An upper bound for the absolute value of a sub n is computed in terms of n and k. Author

N75-18000 British Library Lending Div., Boston Spa (England).
CANONICAL FORM FOR COMMUTING MATRICES
P. S. Kazimirskyj, V. M. Petryckovye, and M. A. Suljar 1974 7 p refs Transl. into ENGLISH from Akad. Nauk Ukrain. RSR (Kiev), 1972 p 492-494
(BLL-M-23308-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A derivation of the canonical form for a pair of commuting

matrices of rank n over an algebraically closed field P is given. In this connection consideration is given to some aspects of the resolution of regular matrices of a quadratic trinomial using linear factors. Author

N75-18001 Polish Academy of Sciences, Warsaw.
SOLUTION OF A WAVE TYPE FOR A HYPERBOLIC SYSTEM OF QUASILINEAR EQUATION [ROZWIAZANIE TYPU FALI BIEGNACEJ DLA UKLADU HIPERBOLICZNEGO ROWNAN QUASI-LINIOWYCH]
Wlodzimierz Laprus 4 Apr. 1973 27 p refs In POLISH
(Rept-16/1973) Avail: NTIS Avail: Issuing Activity

The possibility is discussed of applying the development of a running wave type to the solution of a system of quasi-linear equations, a solution which contains weak discontinuities. Other topics discussed include partial differential equations, transport equations, distortion coefficients, hyperbolic systems, and problem solving. Transl. by M.J.S.

N75-18002 Polish Academy of Sciences, Warsaw.
CLASSIFICATION OF FRICATIVE CONSONANTS BY A METHOD OF ANALYSING PASSAGE THROUGH ZERO [KLASYFIKACJA SPOLGLOSEK TRACYCH METODA ANALIZY PRZEJSC PRZEZ ZERO]
Ryszard Gubrynowicz, Janusz Kacprowski, Wlady slaw Mikiel, and Wojcieh Skalski 18 Aug. 1973 30 p refs In POLISH
(Rept-40/1973) Avail: Issuing Activity

The possibility was investigated of classification and recognition of Polish fricative consonants by using a method of analyzing a speech signal's passage through zero. Other topics discussed include automatic pattern recognition, human communication, acoustics, electronic digital calculators, phonetics, statistical analysis, and random noise. Transl. by M.J.S.

N75-18003 British Library Lending Div., Boston Spa (England).
INVESTIGATION OF THREE-DIMENSIONAL FIELDS BY MEANS OF TWO COORDINATE POTENTIALS
A. I. Knyaz Jan. 1975 14 p refs Transl. into ENGLISH from Kibernetika Vychislitelnaya Tekh. (USSR), no. 22, 1973 p 100-109
(BLL-RTS-9513) Avail: British Library Lending Div., Boston Spa, Engl.: £2.60; 4 BLL photocopy coupons

Colinear coordinates are used to convert the boundary value problem for a three dimensional equation into the boundary value problem for a two coordinate equation. Sets of new systems of coordinates are found which can be used to calculate three dimensional fields by two coordinate potentials. G.G.

N75-18004*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHAIN POOLING TO MINIMIZE PREDICTION ERROR IN SUBSET REGRESSION
Arthur G. Holms 1974 98 p refs Presented at 134th Ann. Meeting of the Am. Statist. Assoc., St. Louis, 26-29 Aug. 1974
(NASA-TM-X-71645; E-8208) Avail: NTIS HC $4.75 CSCL 12A

Monte Carlo studies using population models intended to represent response surface applications are reported. Simulated experiments were generated by adding pseudo random normally distributed errors to population values to generate observations. Model equations were fitted to the observations and the decision procedure was used to delete terms. Comparison of values predicted by the reduced models with the true population values enabled the identification of deletion strategies that are approximately optimal for minimizing prediction errors. Author

N75-18005# Naval Ordnance Lab., White Oak, Md.
HIGHER ORDER COMPACT IMPLICIT SCHEMES FOR THE WAVE EQUATION
Melvyn Ciment and Stephen H. Leventhal 15 Sep. 1974 23 p refs
(ZR0000101)
(AD-A000067; NOLTR-74-159) Avail: NTIS CSCL 12/1

The results of this report are part of an effort to develop high accuracy efficient methods for solving hyperbolic equations. Here an efficient fourth order method for the multi-dimensional wave equation is presented. Similar techniques are being tried to solve first order hyperbolic systems for application to inviscid flow calculations. GRA

N75-18006# Mathematical Applications Group, Inc., Elmsford, N.Y.
EXTENSIONS AND ADJUNCTS TO THE BRL-COMGEOM PROGRAM Final Report, Sep. 1972 - Dec. 1973
Joan Brooks Aug. 1974 45 p refs
(Contract DAAD05-72-C-0101; DA Proj. 1X1-64206-D-378)
(AD-A000897; MR-7035; BRL-CR-177) Avail: NTIS CSCL 12/1

The tasks completed under this contract and described in the report are: (1) The addition to the list of available body types of two new bodies, the general ellipsoid and the arbitrary quadric surface; (2) The development of a geometry preprocessor program capable of producing GIFT input from a more limited, user-oriented, set of descriptions; (3) Development of a BRL-COMGEOM model of the M109A1 tank. The first two tasks are described in some detail. The modeling task is embodied in an input deck for the GIFT code and is described briefly in the last section. GRA

N75-18007# California Univ., San Diego.
ASYMPTOTICS AND REPRESENTATION OF CUBIC SPLINES
Murray Rosenblatt Nov. 1974 24 p refs
(Contract N00014-69-A-0200-6016; NR Proj. 042-217)
(AD-A001013) Avail: NTIS CSCL 12/1

The local asymptotic behavior of a cubic spline interpolator (with equal bin size) and its derivatives is determined to the first order precisely in the interior as the bin size tends to zero. It is shown that this asymptotic behavior is independent of the boundary conditions usually made use of (in the case of spline interpolation on a finite interval). However, if the local behavior at the boundary or global asymptotic behavior is of interest, the type of boundary conditions assumed can determine what happens. Precise estimates of global asymptotic behavior are also derived. An explicit and simple representation is given for the cubic spline interpolator on the infinite line as well as the doubly cubic spline interpolator on the infinite plane. GRA

N75-18025 Joint Publications Research Service, Arlington, Va.
SPECIAL FUNCTIONS
Ya. A. Metsaveer *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 227-262 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 297-338 (For availability see N75-18013 09-70)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N75-18008*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala. Dept. of Mathematical Sciences.
THE EFFECTS OF CORRELATION ON GOODNESS OF FIT
Larry J. Kitchens 6 Jan. 1975 38 p refs
(Contract NAS8-29286)
(NASA-CR-120610) Avail: NTIS HC $3.75 CSCL 12A

Autocorrelated normal random variates were generated via computer and the effects of various levels of correlation on goodness of fit problems were studied. The results are useful in determining the distribution or estimating the parameters of populations that correlate observations such as wind speeds and temperature. The model used to generate the autocorrelated data is an autoregressive process of order 1. The Kolmogorov-Smirnov and chi-square statistics are used in the analysis. It was observed in the simulation that high positive correlations tend to shift the sample mean away from the population mean and negative correlations tend to shift the sample mean towards the population mean. In many cases, it was observed that positive and negative correlations tend to decrease the standard deviation. However, since this did not occur in all cases, no definite conclusion can be made regarding the standard deviation. Since the autoregressive

process is a linear transformation, it is not surprising that normality was preserved. However, a possible extension of this problem could be to generate non-normal data and observe how the distribution is affected by correlation. Another extension might utilize another model such as autoregressive of order k or a moving average process of order k. Author

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

No abstracts in this category.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N75-18009 Suomalainen Tiedeakatemia, Helsinki (Finland).
ON THE GROWTH OF THE FIRST FACTOR OF THE CLASS NUMBER OF THE PRIME CYCLOTOMIC FIELD
Timo Lepistoe 11 Feb. 1974 20 p refs
(ISBN-951-41-0173-1; Rept-577) Copyright. Avail: Issuing Activity

Letting h =h(p) denote the first factor of the class number of the cyclotomic field k(exp (2pi/p), where p is an odd prime, a nonasymptotic estimate for h(p) is determined. Theorems are proved by a method closely connected with the zero-free regions of Dirichlet's L-functions. The same method was also applied under the extended Riemann hypothesis to calculate the effect of these zeros. M.J.S.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N75-18010 British Library Lending Div., Boston Spa (England).
COBALT-RARE EARTH ALLOY PERMANENT MAGNETS
G. Schafer 9 Jul. 1974 9 p refs Transl. into ENGLISH from Dew Tech. Ber. (West Germany), v. 13, no. 3, 1973 p 185-188
(BLL-Risley-TR-2771-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The magnetic and thermodynamic properties of cobalt-rare earth compounds were investigated, and compared with commercially available permanent magnets. Applications and economic factors are presented. F.O.S.

N75-18011 Polish Academy of Sciences, Warsaw.
ELASTIC WAVES IN A DISCRETE STOCHASTIC MEDIUM [FALE SPREZYSTE W DYSKRETNYM OSRODKU STOCHASTYCZNYM]
Kazimierz Sobczyk 25 Jan. 1974 76 p refs In POLISH
(Rept-5/1974) Avail: Issuing Activity

Wave propagation and attenuation in a discrete stochastic medium is discussed. Waves in elastic, homogeneous, and isotropic solid media containing random distribution of scattered elements are considered. It was found that these elements can be inclusions (with elastic properties differing in properties from a surrounded medium), voids, and zones filled with liquid. Other topics discussed include mean summary fields, approximation equations, long and transverse wave attenuation, spherical elements, and low frequency attenuation. Transl. by M.J.S.

N75-18012*# Analytical Systems Engineering Corp., Burlington, Mass.
ANALYSIS OF SATELLITE MEASUREMENTS OF TERRESTRIAL RADIO NOISE Final Report, 7 Nov. 1973 - 7 May 1974
George Bakalyar, Joseph Caruso, Richard Vargas-Vila, and Edward Ziemba Sep. 1974 136 p refs
(Contract NAS5-23224)
(NASA-CR-143679; ASECR-74-71) Avail: NTIS HC$5.75 CSCL 20N

Worldwide distributions of terrestrial radio noise as monitored by Radio Astronomy Explorer 1 (RAE 1) generated and compared with CCIR predictions. These contour maps show the global morphology of radio noise at 6.55 and 9.18 MHz for fall, winter, spring and summer during the local time blocks of 00-08 LT and 16-24 LT. These computer produced maps show general agreement with CCIR predictions over large land masses. The RAE and CCIR maps diverge at high latitudes over Asia and frequently over ocean regions. Higher noise levels observed by RAE at high latitudes are attributed to magnetospheric emission while higher noise levels observed by RAE over Asia are attributable to high power transmitters. Analysis of RAE noise observations in conjunction with various geophysical phenomena showed no obvious correlation. Author

N75-18013# Joint Publications Research Service, Arlington, Va.
ECHO SIGNALS FROM ELASTIC OBJECTS
U. K. Nigul, ed. 22 Jan. 1975 267 p refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974
(JPRS-63937) Avail: NTIS HC $8.50

An examination is presented of two dimensional echo signals from an elastic spherical shell, solid elastic sphere and other centrosymmetric spherical objects as the result of interaction of probing pulses of finite length, representing a centrosymmetric spherical wave. Various methods of calculating the echo signal are described and examples are presented, based on the application of integral transforms. For individual titles, see N75-18014 through N75-18025.

N75-18014 Joint Publications Research Service, Arlington, Va.
LINEAR THEORY OF TWO-DIMENSIONAL ECHO SIGNALS FROM ELASTIC SPHERICAL OBJECTS c71
U. K. Nigul, Ya. A. Metsaveer, N. D. Veksler, and M. E. Kutser *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 3-9 Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 9-16 (For availability see N75-18013 09-70)

Echo signals that arrive from elastic spherical objects are examined as a result of the action of a spherical wave of the probing pulse type of finite length. Both spherical objects and spherical waves of the stated type are considered centrosymmetric, and the medium is assumed to be homogeneous and boundless. By virtue of these stipulations the examined wave processes are two-dimensional, axially symmetric relative to the axis passing through the centers of the object and source of spherical waves, which fundamentally simplifies the problem of mathematical modeling of the nonstationary wave process of echo formation. Author

N75-18015 Joint Publications Research Service, Arlington, Va.
STATEMENT OF PROBLEMS AND THEIR SOLUTIONS AS CONTOUR INTEGRALS c71
N. D. Veksler, Ya. A. Metsaveer, and U. K. Nigul *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 10-56 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 17-78 (For availability see N75-18013 09-70)

Integral Fourier and Laplace time transforms are used for constructing the solution of the stated problems as contour integrals from dimensionless series. These solutions are used where the specific calculation of echo signals from spherical objects is examined using various conversion methods. Author

N75-18016 Joint Publications Research Service, Arlington, Va.
METHOD OF NUMERICAL INVERSION OF FOURIER TIME TRANSFORM AS SUM OF TRANSFORMS OF CREEPING WAVES c71
N. D. Veksler, Ya. A. Metsaveer, and U. K. Nigul *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 57-91 refs Transl. into ENGLISH from the book "Ekho-Signaly

ot Uprugukh Obyektov, Volume 2" Tallin, 1974 p 79-125 (For availability see N75-18013 09-70)

The description and some of the results of the application of the method are presented. An auxiliary function, in the form of an infinite series, to the accuracy of some finite number of terms, is computed numerically, and the approximate inversion integral is found by means of numerical integration in a finite range. Also presented are diagrams of echo signals from various spherical objects. Author

N75-18017# Joint Publications Research Service, Arlington, Va.
METHOD OF SUMMATION OF ANGULAR-TRAVELING WAVE GROUPS USING FOURIER TIME TRANSFORM **c71**

Ya. A. Metsaveer *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 92-123 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 127-165 (For availability see N75-18013 09-70)

A method of calculating an echo signal, based on the application of the Fourier transform and Sommerfeld-Watson transform in terms of the angular coordinate for representing the echo signal as a double contour integral, is described. The inversion of these contour integrals in the case of a deformable object, representing an empty spherical shell, described by linear elastic shell theories, is examined. The inversion of the Sommerfeld-Watson transform is accomplished by calculating the contributions of residues and saddle point. It is found that the saddle point determines the reflected wave and the residues determine the circumferential and creeping waves. A method of approximate inversion of the Fourier time transform in the case of a sinusoidal sounding pulse of finite duration is described. The results of calculation of the echo signal from shells made of material with different parameters are presented for a wide range of change of shell thickness and sounding pulse frequency. Author

N75-18018 Joint Publications Research Service, Arlington, Va.
THE METHOD OF SUMMATION OF ANGULAR STANDING WAVES BY LAPLACE TIME TRANSFORM **c71**

N. D. Veksler *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 124-143 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 167-189 (For availability see N75-18013 09-70)

A method of echo signal calculation, based on the application of the integral Laplace time transform and on the separation of variables in the space of transforms in radial and angular coordinates, is described. The echo signal transform is represented as an infinite series in Legendre polynomials, the coefficients of which contain spherical Bessel functions of an imaginary argument. The conversion from spherical Bessel functions of an imaginary argument to Stokes polynomials makes it possible to carry out the exact inversion of the series, achieved by using the Cauchy theorem of residues and theorems of convolution and translation. Author

N75-18019 Joint Publications Research Service, Arlington, Va.
METHOD OF SUMMATION OF FAST CHANGING ANGULAR TRAVELING WAVES WITH ASYMPTOTIC INVERSION OF LAPLACE TIME TRANSFORM **c71**

M. E. Kutser and Ya. A. Metsaveer *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 144-163 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 191-215 (For availability see N75-18013 09-70)

A method of calculating an echo signal, based on the application of the Laplace time transform and Sommerfeld-Watson transform in terms of angular coordinate for representing an echo signal as a double integral, is described. The inversion of these contour integrals is explained for the case of a deformed object, representing an empty spherical shell, described by linear elastic shell theories. Inversion of the Sommerfeld-Watson transform is accomplished by calculating the contributions of the residues and saddle point. It is shown that the saddle point determines the reflected pulse and the residues determine the circumferential and creeping pulses. During calculation of the residues the coordinates of the poles on the complex plane are determined to the accuracy of asymptotic approximation. The described method, in view of what is said above, yields an asymptotic approximation of the fast changing components of the echo signal. From the physical viewpoint the computed echo signal components represent traveling waves. Author

N75-18020 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF GEOMETRIC AND PHYSICAL PARAMETERS OF EMPTY SPHERICAL SHELL ACCORDING TO ECHO SIGNAL **c71**

Ya. A. Metsaveer and U. K. Nigul *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 164-175 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 217-231 (For availability see N75-18013 09-70)

The determination of the parameters of an empty spherical shell in a medium with known physical constants by using experimentally recorded parameters of an echo signal, produced by the action of an incident pulse of finite duration, of the spherical acentrosymmetric wave type, on a shell, is examined. Algorithms are presented for calculating the radius and thickness of the shell, and the propagation velocity of longitudinal waves in the material of the shell. Specific calculations are given for the case when the incident pulse is sinusoidal in character and the echo signal is recorded in the center of the source of the incident pulse. These algorithms are based on the results obtained during description of the behavior of a shell on the basis of linear shell theory of the Timoshenko type. Author

N75-18021 Joint Publications Research Service, Arlington, Va.
NONLINEAR THEORIES OF ELASTICALLY DEFORMABLE SOLIDS, LIQUIDS AND GASES IN CARTESIAN COORDINATES **c39**

U. K. Nigul and Yu. K. Engelbrekht *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 176-192 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 233-253 (For availability see N75-18013 09-70)

Euler and Lagrangian variables are discussed. The time invariant Euler Cartesian coordinate system, which serves as a space inertial reference system is described. M.C.F.

N75-18022 Joint Publications Research Service, Arlington, Va.
LINEAR ELASTICITY THEORY **c39**

U. K. Nigul and Yu. K. Engelbrekht *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 193-204 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 254-268 (For availability see N75-18013 09-70)

Specific mathematical models of nonlinear theory of elastically deformable solids were derived from the general equations of continuum theory with the aid of additional postulates and assumptions. The mathematical models are described with the aid of quasi-linear differential equations and relations. The linearization of the stated quasi-linear differential equations and relations is examined. The results of this linearization is a linear mathematical model, customarily called linear elasticity theory. Author

N75-18023 Joint Publications Research Service, Arlington, Va.
LINEAR PERFECT COMPRESSIBLE FLUID THEORY **c34**

U. K. Nigul and Yu. K. Engelbrekht *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 205-207 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 269-272 (For availability see N75-18013 09-70)

The postulates of the theory of a perfect compressible liquid are presented in Cartesian coordinates. Author

N75-18024 Joint Publications Research Service, Arlington, Va.
NONLINEAR AND LINEAR THEORIES OF AXIALLY SYMMETRIC DEFORMATION OF THIN ELASTIC SHELLS OF REVOLUTION **c39**

A. Ya. Lakhe *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Feb. 1975 p 208-226 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 273-295 (For availability see N75-18013 09-70)

An orthogonal Lagrangian coordinate system, introduced for

the radius vectors of an arbitrary point of an undeformed and deformed shell are described. The equations of nonlinear shell theory of the Timoshenko type are discussed from the equations of nonlinear elasticity theory. M.C.F.

N75-18025 Joint Publications Research Service, Arlington, Va.
SPECIAL FUNCTIONS **c64**
Ya. A. Metsaveer *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 227-262 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 297-338 (For availability see N75-18013 09-70)

Basic properties and solutions of the Bessel, Hankel and Neumann functions are discussed. Cylindrical and spherical functions are also discussed. M.C.F.

N75-18026# Institutul de Fizica Atomica, Bucharest (Romania).
LANDAU DIAMAGNETISM
N. Angelescu, G. Nenciu, and M. Bundaru 1974 36 p refs (IFA-FT-109-1974) Avail: AEC Depository Libraries HC $5.00

The grand-canonical partition function of an assembly of free spinless electrons in a magnetic field enclosed in a box A (Dirichlet boundary conditions) is shown to be an entire function of the fugacity Z and the magnetic fiel H. The tracenorm convergence of the perturbation series is proved in powers of h for the statistical semigroup. Author (NSA)

N75-18027# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ONE-DIMENSIONAL INTEGRAL EQUATIONS OF THE SECOND KIND FOR PROBLEMS OF THE DIFFRACTION OF ELECTROMAGNETIC WAVES ON CYLINDRICAL BODIES
E. V. Zakharov, I. P. Kotik, and A. N. Sivov 11 Oct. 1974 20 p refs Transl. into ENGLISH from Sb. Rabot Moscow Univ. Vychislitelnyi Tsentr., no. 13, 1969 p 177-188
(AD-A000157; FTD-HT-23-1821-74) Avail: NTIS CSCL 20/14

Simple one dimensional integral equations for the numerical solution of initial boundary value problems are shown to correspond to two- and three-dimensional diffraction problems for cylindrical bodies. One dimensional equations were obtained for electromagnetic wave diffraction on several heterogeneous bodies, and for E and M polarizations. The algorithm for the solution to the problem of diffraction on a symmetrical lens is analyzed. F.O.S.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N75-18028*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPINNING MODE SOUND PROPAGATION IN DUCTS WITH ACOUSTIC TREATMENT AND SHEARED FLOW
Edward J. Rice 1975 22 p refs Presented at 2d Aeroacoustics Specialists Conf., Hampton, Va., 24-26 Mar. 1975; sponsored by AIAA
(NASA-TM-X-71672; E-8261) Avail: NTIS HC $3.25 CSCL 20A

The propagation of spinning mode sound was considered for a cylindrical duct with sheared steady flow. Calculations concentrated on the determination of the wall optimum acoustic impedance and the maximum possible attenuation. Both the least attenuated and higher radial modes for spinning lobe patterns were considered. A parametric study was conducted over a wide range of Mach numbers, spinning lobe numbers, sound frequency, and boundary layer thickness. A correlation equation was developed from theoretical considerations starting with the thin boundary layer approximation of Eversman. This correlation agrees well with the more exact calculations for inlets and provides a single boundary layer refraction parameter which determines the change in optimum wall impedance due to refraction effects. Author

N75-18029*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GENERALIZED WAVE ENVELOPE ANALYSIS OF SOUND PROPAGATION IN DUCTS WITH STEPPED NOISE SOURCE PROFILES AND VARIABLE AXIAL IMPEDANCE
Kenneth J. Baumeister 1975 16 p refs Presented at 2d Aeron. Specialists Conf., Hampton, Va., 24-26 Mar. 1975; sponsored by AIAA
(NASA-TM-X-71674; E-7941) Avail: NTIS HC $3.25 CSCL 20A

A finite difference formulation is presented for sound propagation in a rectangular two-dimensional duct without steady flow. Before the difference equations are formulated, the governing Helmholtz equation is first transformed to a form whose solution tends not to oscillate along the length of the duct. This transformation reduces the required number of grid points by an order of magnitude. Example solutions indicate that stepped noise source profiles have much higher attenuation than plane waves in a uniform impedance liner. Also, multiple stepped impedance liners are shown to have higher attenuation than uniform ducts if the impedances are chosen properly. For optimum noise reduction with axial variations in impedance, the numerical analysis indicates that for a plane wave input the resistance should be near zero at the entrance of a suppressor duct, while the reactance should be near the optimum value associated with the least-attenuated mode in a uniform duct. Author

N75-18030*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ON THE EXCESS ATTENUATION OF SOUND IN THE ATMOSPHERE
Richard DeLoach Washington Mar. 1975 74 p refs
(NASA-TN-D-7823; L-9724) Avail: NTIS HC $4.25 CSCL 20A

The attenuation suffered by an acoustic plane wave propagating from an elevated source to the ground, in excess of absorption losses, was studied. Reported discrepancies between attenuation measurements made in the field and theories which only account for absorption losses are discussed. It was concluded that the scattering of sound by turbulence results in a non-negligible contribution to the total attenuation. Author

N75-18031# Naval Research Lab., Washington, D.C.
PROPOSAL FOR THE DEVELOPMENT OF A HIGH POWER, LOW FREQUENCY UNDERWATER ACOUSTIC SOURCE
A. M. Young 1 Nov. 1974 10 p
(NRL Proj. S02-31; RF11121403)
(AD-A000657; NRL-MR-2897) Avail: NTIS CSCL 20/1

A program for the development of a high-power underwater acoustic source for use at infrasonic and low-audio frequencies is proposed. This source is in the form of a three-element line array, each of whose elements is a transducer of existing design, the USRD type J15-3. Unique features of this source are its small size, light weight, and its ability to operate with a minimum of peripheral equipment. The primary objectives of the program are construction and evaluation of one such array. Improvement of the performance of the individual array radiators is a secondary objective of the program. Author (GRA)

N75-18032# Stanford Univ., Calif. Thermosciences Div.
DEVELOPMENT OF A NEW INTERNAL FLOW AEROACOUSTIC FACILITY. AERODYNAMIC AND ACOUSTIC EXPERIMENTS ON SQUARE-EDGED ORIFICES
D. W. Roberts and J. P. Johnston Sep. 1974 125 p refs
(Grant NSF GK-37294)
(PB-237165/6; SU-PD-18) Avail: NTIS HC $5.25 CSCL 14B

Research apparatus for study of noise generation and sound wave propagation in pipes with restrictions (orifices, nozzles, valves, etc.) is described. It is a long, PVC plastic pipe of 3.82 inch inside diameter with anechoic terminations that absorb almost all incident sound at frequencies above 200 Hz. The test restrictions are placed midway along the pipe between special flow inlet and outlet sections that minimize background noise

and reduce disturbances to acoustic waves propagating along the pipe. Five standard A.S.M.E. flow metering orifices with different orifice diameters were tested for flow and noise generation characteristics. GRA

N75-17730 Joint Publications Research Service, Arlington, Va.
ANTIWAVEGUIDE PROPAGATION
L. M. Brekhovskikh *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 72-81 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 154-161 (For availability see N75-17725 09-42)

N75-17733 Joint Publications Research Service, Arlington, Va.
FLUCTUATIONS OF THE SIGNAL REFLECTED BY THE WAVE OCEAN SURFACE
S. D. Chuprov *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 118-150 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 334-360 (For availability see N75-17725 09-42)

N75-17734 Joint Publications Research Service, Arlington, Va.
SOUND FIELD RE-EMITTED BY THE SURFACE IN THE MIRROR DIRECTION AND NEAR IT
I. B. Andreyeva *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 151-164 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 361-371 (For availability see N75-17725 09-42)

N75-17735 Joint Publications Research Service, Arlington, Va.
METHOD OF EXPERIMENTAL STUDY OF THE BACKSCATTER SOUND BY THE OCEAN SURFACE
I. B. Andreyeva *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 165-177 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 371-381 (For availability see N75-17725 09-42)

N75-17736 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL CHARACTERISTICS OF THE SURFACE BACKSCATTER
I. B. Andreyeva *In its* Acoustics of the Ocean, Part 1 (JPRS-64008-1) 31 Jan. 1975 p 178-191 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 382-392 (For availability see N75-17725 09-42)

N75-17738 Joint Publications Research Service, Arlington, Va.
REFLECTION OF SOUND FROM THE OCEAN BOTTOM. EXPERIMENTAL PROCEDURE
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 201-212 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 397-407 (For availability see N75-17737 09-42)

N75-17739 Joint Publications Research Service, Arlington, Va.
STATISTICAL CHARACTERISTICS OF ECHOES
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 213-234 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 408-425 (For availability see N75-17737 09-42)

N75-17740 Joint Publications Research Service, Arlington, Va.
RELATION OF THE CHARACTERISTICS OF THE ECHOES TO THE GENERAL BOTTOM RELIEF
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 235-253 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 425-440 (For availability see N75-17737 09-42)

N75-17741 Joint Publications Research Service, Arlington, Va.
FREQUENCY AND ANGULAR DEPENDENCE OF THE CHARACTERISTICS OF ECHOES
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 254-266 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 440-450 (For availability see N75-17737 09-42)

N75-17742 Joint Publications Research Service, Arlington, Va.
SCATTERING OF SOUND BY THE OCEAN BOTTOM. RESEARCH PROCEDURE
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 267-275 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 451-457 (For availability see N75-17737 09-42)

N75-17743 Joint Publications Research Service, Arlington, Va.
ANALYSIS AND PROCESSING OF EXPERIMENTAL DATA
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 276-287 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 458-467 (For availability see N75-17737 09-42)

N75-17744 Joint Publications Research Service, Arlington, Va.
SOUND DISPERSION IN REGIONS WITH LEVELED RELIEF
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics in the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 288-293 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 467-472 (For availability see N75-17737 09-42)

N75-17745 Joint Publications Research Service, Arlington, Va.
SCATTERING OF SOUND IN REGIONS WITH RUGGED TOPOGRAPHY
V. I. Volovov and Yu. Yu. Zhitkovskiy *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 294-305 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 472-480 (For availability see N75-17737 09-42)

N75-17747 Joint Publications Research Service, Arlington, Va.
SCATTERING ON RANDOM INHOMOGENEITIES AND SOUND FIELDS IN THE OCEAN
R. F. Shvachko *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 328-350 Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 562-581 (For availability see N75-17737 09-42)

N75-17748 Joint Publications Research Service, Arlington, Va.
SIGNAL FLUCTUATIONS DURING THE PROPAGATION OF SOUND IN THE OCEAN
S. D. Chuprov *In its* Acoustics of the Ocean, Part 2 (JPRS-64008-2) 31 Jan. 1975 p 351-394 refs Transl. into ENGLISH from the book "Akustika Okeana" Moscow, Izd. Nauka, 1974 p 581-612 (For availability see N75-17737 09-42)

N75-18014 Joint Publications Research Service, Arlington, Va.
LINEAR THEORY OF TWO-DIMENSIONAL ECHO SIGNALS FROM ELASTIC SPHERICAL OBJECTS
U. K. Nigul, Ya. A. Metsaveer, N. D. Veksler, and M. E. Kutser *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 3-9 Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 9-16 (For availability see N75-18013 09-70)

N75-18015 Joint Publications Research Service, Arlington, Va.
STATEMENT OF PROBLEMS AND THEIR SOLUTIONS AS CONTOUR INTEGRALS
N. D. Veksler, Ya. A. Metsaveer, and U. K. Nigul *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 10-56 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 17-78 (For availability see N75-18013 09-70)

N75-18016 Joint Publications Research Service, Arlington, Va.
METHOD OF NUMERICAL INVERSION OF FOURIER TIME TRANSFORM AS SUM OF TRANSFORMS OF CREEPING WAVES
N. D. Veksler, Ya. A. Metsaveer, and U. K. Nigul *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 57-91 refs Transl. into ENGLISH from the book "Ekho-Signaly

ot Uprugukh Obyektov, Volume 2" Tallin, 1974 p 79-125 (For availability see N75-18013 09-70)

N75-18017# Joint Publications Research Service, Arlington, Va.
METHOD OF SUMMATION OF ANGULAR-TRAVELING WAVE GROUPS USING FOURIER TIME TRANSFORM
Ya. A. Metsaveer *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 92-123 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 127-165 (For availability see N75-18013 09-70)

N75-18018 Joint Publications Research Service, Arlington, Va.
THE METHOD OF SUMMATION OF ANGULAR STANDING WAVES BY LAPLACE TIME TRANSFORM
N. D. Veksler *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 124-143 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 167-189 (For availability see N75-18013 09-70)

N75-18019 Joint Publications Research Service, Arlington, Va.
METHOD OF SUMMATION OF FAST CHANGING ANGULAR TRAVELING WAVES WITH ASYMPTOTIC INVERSION OF LAPLACE TIME TRANSFORM
M. E. Kutser and Ya. A. Metsaveer *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 144-163 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 191-215 (For availability see N75-18013 09-70)

N75-18020 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF GEOMETRIC AND PHYSICAL PARAMETERS OF EMPTY SPHERICAL SHELL ACCORDING TO ECHO SIGNAL
Ya. A. Metsaveer and U. K. Nigul *In its* Echo Signals from Elastic Objects (JPRS-63937) 22 Jan. 1975 p 164-175 refs Transl. into ENGLISH from the book "Ekho-Signaly ot Uprugikh Obyektov, Volume 2" Tallin, 1974 p 217-231 (For availability see N75-18013 09-70)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N75-18033# Tennessee Univ., Knoxville. Dept. of Physics and Astronomy.
[STRUCTURE OF HIGHLY STRIPPED IONIZED GASES, AND HEAVY IONS AND ASSOCIATED COLLISIONS] Technical Reports, 1 May - 30 Sep. 1974
Ivan A. Sellin 20 Sep. 1974 98 p refs
(Contracts N00014-71-A-0121; N00014-71-A-0121-0002)
(AD-786761/7) Avail: NTIS HC $4.75

Accumulated preprints and reprints of articles plus abstracts are included, together with a catalog. Reports include: lifetimes of the metastable autoionizing states of lithiumlike A1(10+) and Si(11+) ions; comparisons with theory over the isoelectronic sequence z=8.18; symmetricion atom collisions at medium energies I: characteristic X rays; characterization of charge states of energetic ions in solids from associated K X-ray production; autoionizing lifetimes of the metastable state in the lithiumlike ions A1(10+), Si(11+), and S(13+); XUV spectra of highly ionized fluorine and oxygen; new lines in the XUV spectrum of heliumlike fluorine; radiative transitions in two-electron oxygen; neon K alpha, K beta satellite structure induced by 80-MeV argon-ion impact; observation of K X-rays from highly ionized states of neon produced by 40 MeV C1(+&), C1(+11), and C1(+13) beams; charge state dependence of Si K X-ray production in solid and gaseous targets by 40 MeV oxygenion impact. GRA

N75-18034*# Denver Univ., Colo. Dept. of Physics and Astronomy.
LABORATORY STUDIES OF INFRARED ABSORPTION BY NO2 AND HNO3 Final Report
D. G. Murcray, A. Goldman, and F. Bonomo [1975] 22 p refs
(Grant NGR-06-004-128)
(NASA-CR-142190) Avail: NTIS HC $3.25 CSCL 20F

Data concerning the quantitative absorption in the 11 and 22 micron region by HNO3 were obtained. Results are presented indicating the temperature dependence of these bands of HNO3 vapor. The 21.8 micron absorption bands of HNO3 vapor at 40 C are discussed along with the integrated intensity and line parameters for the 6.2 micron band of NO2. F.O.S.

N75-18035*# General Motors Corp., Santa Barbara, Calif.
MOLECULAR FLUORESCENCE AS A MONITOR OF MINOR STRATOSPHERIC CONSTITUENTS
K. Schofield Washington NASA Feb. 1975 177 p refs
(Contract NAS2-7861)
(NASA-CR-2513) Avail: NTIS HC $7.00 CSCL 20H

The potential of molecular fluorescence was assessed as a stratospheric monitor of the concentrations of various minor species. Seventeen molecules were considered and all spectral regions from the vacuum ultraviolet through to the infrared are included. The exercise has produced few surprises; however, further confirmation has emerged as to the feasibility of this sensitive technique for monitoring stratospheric OH, NO2, and SO2, sufficient to warrant its development as analytical flight hardware for these species. All the other molecules have been eliminated with the exception of C10 which appears to have promise but requires additional information before its detection limit can be calculated; its fluorescence spectrum is as yet uninvestigated. A handbook for molecular fluorescence is presented, and a compilation of all reported studies for simple molecules using line source excitation is included. Author

N75-18036# California Univ., Livermore. Lawrence Livermore Lab.
AMPLIFIER THEORY
F. A. Hopf 16 Sep. 1974 28 p refs Sponsored by AEC
(UCRL-76043) Avail: NTIS HC $3.75

It is shown how the two-level atom theory is modified to treat the situation presented by amplification on rotational-vibrational transitions in molecules. Several differences of minor consequences in the amplifier exist between molecular and electronic transitions. The important difference is that the rotational collisions in molecules occur very rapidly, approximately T sub 2. Pressure-broadened operation usually occurs in practical applications (pressure greater than or equal to 10 Torr), and one cannot consider pulses that are of the order of T sub 2 without considering rotational effects. The CO2 transition of 001 100 is shown. The energy is initially stored in the upper vibrational rotational states. As the energy is extracted from the single lasing level, the rotational levels repopulate the active state via rapid collisions and appear in the equations in the form of a pump term. Since there is only a finite amount of energy in the rotational states, the pump can saturate. The mathematical analysis suggests that the experiment depends on chemical pump processes without substantial alteration due to rotational kinetics. Shortpulse amplication in CO is briefly evaluated. Author (NSA)

N75-18037# Oregon Univ., Eugene. Dept. of Physics.
X-RAY FLUORESCENCE YIELDS AND PHOTOELECTRIC CROSS SECTIONS AND ATOMIC INNER-SHELL TRANSITIONS Final Report, 1 Nov. 1971 - 31 Oct. 1974
Bernard Crasemann 31 Oct. 1974 12 p refs
(Grant DA-ARO(D)-31-124-72-G39; Contract DAHC04-74-G-0065; DA Proj. DO1-61102-B-11B)
(AD-A001237) Avail: NTIS CSCL 07/4

The final report briefly summarizes research on contracts entitled X-Ray Fluorescence Yields and Photoelectric Cross Sections, and Atomic Inner-Shell Transitions. GRA

N75-18038# Science Applications, Inc., La Jolla, Calif.
FURTHER OPTICAL-INFRARED RADIATION STUDIES. VOLUME 2: A MODEL FOR DESCRIBING RADIATION PROCESSES Final Report, 1 Feb. 1973 - 1 Feb. 1974
Benjamin F. Myers and Melvin R. Schoonover 25 Oct. 1974 59 p refs
(Contract DNA001-73-C-0147; DNA Proj. NWET L25AAXY)

(AD-A000050; SAI-74-549-LJ-Vol-2; DNA-3345F-2) Avail: NTIS CSCL 07/4

The report describes a model which is suitable for rapid calculation of the population distribution among energy levels in radiating species and of radiation in selected spectral intervals as well as band profiles for vibration-rotation bands. In calculating the population distribution among energy levels, the steady-state assumption was made for a system in which five types of transitions occur: the formation of the radiating molecule in each energy level by reaction(s), the loss from each energy level by reaction(s) and the formation of loss of molecules in each energy level by (1) collisional excitation, (2) collisional de-excitation or (3) radiative decay of molecules in that or other energy levels. The density of the radiating molecules in each energy level is given in a canonical form with associated recursion relations which permit rapid evaluation of the density. Illustrative calculations are provided for nitric oxide as the radiating molecule. (Modified author abstract) GRA

N75-18039# Intelcom Rad Tech, San Diego, Calif.
NEW ATOMIC BEAM STUDIES AT LOW ENERGIES Final Report
R. H. Neynaber, J. A. Rutherford, and D. A. Vroom 20 Aug. 1974 64 p refs
(Contract DNA001-74-C-0036; DNA Proj. NWED-QAXHD)
(AD-A000061; RT-8100-005; NDA-3384F) Avail: NTIS CSCL 07/4

The major effort has been directed toward production of stable neutral beams of uranium and thorium, and measurement of charge transfer processes between these atomic species and the atmospheric ions N+ and O+. The processes studied can be represented as O(+) + U to O + U(+), N(+) + U to N + U(+), O(+) + to O + Th(+), and N(+) + Th to N + Th(+). These reactions are of importance because they may act as sinks for U and Th neutral species. Information on the fate of U and Th is of importance in the development of radar and optical systems codes. In the course of the above measurements, cross sections were also obtained for the charge transfer reactions of U and Th with CO2(+) and N2(+). A secondary effort was the measurement of charge transfer cross sections for ground and excited state O(+) ions in collision with O2 and NO. (Modified author abstract) GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N75-18040 British Library Lending Div., Boston Spa (England).
THE STATE OF FERRITES AFTER HIGH-ENERGY IRRADIATION
W. Dersch 11 Sep. 1974 6 p refs Transl. into ENGLISH from Siemens-Z. (West Germany), v. 46, no. 2, 1974 p 114-116
(BLL-Trans-893-(9022.64)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The radiation effects on ferrites are discussed. The corpuscular radiation of space travel is simulated to investigate electronic component reactions. The change in properties of ferrite materials are investigated, after radiation, by using toroidal cores. M.C.F.

N75-18041# Los Alamos Scientific Lab., N.Mex.
INITIATIVES OF THE LOS ALAMOS SCIENTIFIC LABORATORY IN THE TRANSFER OF A NEW EXCAVATION TECHNOLOGY
R. J. Hanold, C. A. Bankston, J. C. Rowley, and W. W. Long 1974 12 p refs Presented at the World Conf. on Toward a Plan of Actions for Mankind: Needs and Resources Methods of Prevision, Paris, 9 Sep. 1974 Sponsored by AEC
(LA-UR-74-1328; Conf-740938-1) Avail: NTIS HC $3.25

Research activities on metal and graphite core nuclear propulsion reactors (AEC/NASA Rover Program) resulted in significant high temperature materials science technology developments. These capabilities were recently applied to excavation technology through the introduction of a rock-melting penetrator system. Rock melting was recognized as an innovation that simultaneously attacks the three major problems of excavation, namely rock fracturing, debris removal, and wall stabilization, with an inherently integrated system. The technology transfer efforts of the laboratory were aimed at commercial producers and users of excavation equipment as well as customers for excavations. Activities carried out to inform these sectors of the potential usefulness of rock melting were outlined. The experience of LASL's experience in these technological initiatives and the dissemination of technological achievements which result from federally funded R and D projects are discussed.
Author (NSA)

N75-18042# Sandia Labs., Albuquerque, N.Mex.
METALLURGICAL PROCESSING AND PULSED REACTOR FUEL PERFORMANCE
J. P. Hickerson, Jr. Jul. 1974 89 p refs
(Contract AT(29-1)-789)
(SLA-73-1121) Avail: NTIS HC $4.75

Metallurgical methods for improving fuel performance were studied. It was concluded that fatigue failure is responsible for fuel fractures and that changes in fuel processing are the most practical means of achieving improvement. A hot forging step was chosen for investigation. Four prototype fuel plates of depleted U-10Mo alloy were produced, two by conventional casting and two by upset forging cast cylinders to final dimensions. Test specimens were examined metallographically, tensile tested, fatigue tested, and Charpy impact tested. It was found that after forging tensile strength and high temperature elongation increased, fatigue properties were more consistent, and Charpy toughness increased. Casting porosity was found to be removed by the hot working step. Mechanical property improvements could be attributed to a grain size reduction and the dispersal of grain boundary carbide networks effected by the forging operation.
Author (NSA)

N75-18043# American Nuclear Society, Los Angeles, Calif.
PROCEEDINGS OF THE FAST REACTOR SAFETY MEETING
1974 542 p refs Meeting held at Beverly Hills, Calif., 2-4 Apr. 1974
(Conf-740401-P1) Avail: NTIS HC $12.50

Information on fast reactors is presented concerning safety related criteria and design features for next-round LMFBR's, steam generators, TREAT fuel behavior experiments, fast reactor safety research needs, sodium fires, aerosols, and plutonium. NSA

N75-18044# American Nuclear Society, Los Angeles, Calif.
PROCEEDINGS OF THE FAST REACTOR SAFETY MEETING
1974 504 p refs Conf. held in Beverly Hills, Calif., 2-4 Apr. 1974 Sponsored by AEC
(Conf-740401-P3) Avail: NTIS HC $12.25

Information on fast reactors concerning sodium boiling and flow blockage, accident analysis, alternate shutdown systems, instrumentation and probability evaluation and selection of safety design bases for fast power reactors is presented. NSA

N75-18045# Interuniversitair Reactor Instituut, Delft (Netherlands).
THE EFFECT OF DEAD TIME ON THE STOCHASTICS OF PULSE DETECTION SYSTEMS [OVER DE INVLOED VAN DODE TIJD OP DE STOCHASTIEK BIJ PULSDETEKTIESYSTEMEN]
J. W. deVries May 1974 51 p refs In DUTCH; ENGLISH summary
(IRI-131-74-01) Avail: NTIS HC $4.25

Pulse counting losses as a result of dead time phenomena have been investigated, notably for the recording of nuclear radiation. Expressions were derived for the mathematical expectation and variance of counting results in various types of counting channels. Corrections for counting losses are discussed for the various cases. The determination of counting channel dead time, by means of the two-preparation method, is dealt with and an error analysis is presented. ESRO

N75-18046# Naval Research Lab., Washington, D.C.
GIGAWATT MICROWAVE EMISSION FROM AN INTENSE RELATIVISTIC ELECTRON BEAM Final Report
V. L. Granatstein, M. Herndon, and J. A. Nation Aug. 1974 14 p refs
(NRL Proj. R08-53; NRL Proj. R08-59)
(AD-A000816; NRL-MR-2856) Avail: NTIS CSCL 20/14

Microwave generation experiments were carried out on a multimegavolt electron accelerator (3.3 MV, 80 kA). X-band microwave power as high as about 1 GW was measured. Results are compared with a non-linear theory of unstable resonant interaction between a TE waveguide mode of the electron drift tube and an electron cyclotron wave on the beam. GRA

74 OPTICS

Includes light phenomena.

N75-18047*# Fisk Univ., Nashville, Tenn.
OPTICAL EFFECT OF THE CONTAMINATION OF INFRARED WINDOWS BY THE OUTGASSING OF MATERIALS IN OUTER SPACE Semiannual Status Report, period ending 1 Jan. 1975
E. Silberman 1 Jan. 1975 5 p
(Grant NGR-43-021-002)
(NASA-CR-142074) Avail: NTIS HC $3.25 CSCL 20F

The composition and evaporation rate of the outgassing of a space vehicle thermal control paint as a function of temperature were studied. A contamination chamber was designed, constructed, and tested. Samples of thermal control paint were tested to determine if heating to moderate temperatures causes them to release outgassing products which can be collected on a cooled cesium iodide window for identification by IR analysis. Results showed that outgassing of surfaces other than the sample was a problem. Spectral bands of the deposits collected were compared. J.M.S.

N75-18048*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
OPTICAL TRANSFER FUNCTION OF STARLETTE RETROREFLECTOR ARRAY
David A. Arnold Feb. 1975 34 p
(Grant NGR-09-015-002)
(NASA-CR-142291; RTOP-161-05-02) Avail: NTIS HC $3.75 CSCL 20F

An optical transfer function was computed for the retroreflector array carried by the Starlette satellite (1975 10A). The range correction is given for extrapolating laser range measurements to the center of mass of the satellite. The gain function and active reflecting area of the array are computed for estimating laser-echo signal strengths. Author

N75-18049# Army Foreign Science and Technology Center, Charlottesville, Va.
NEW TYPE OF DISPERSION FILTER FOR THE INFRARED RANGE OF THE SPECTRUM
N. A. Borisevich and V. G. Vereshchagin 25 Feb. 1974 10 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskopii (USSR), v. 12, no. 1, 1970 p 168-172
(AD-A000227; FSTC-HT-23-1831-73) Avail: NTIS CSCL 20/6

New types of crystal-crystal dispersion filters recently introduced and their practical use. Alkali-halide crystals were used together with various sulfides, carbonates, etc. as a secondary component. After testing at various temperatures, the resultant filters were shown to be stable and mechanically strong. GRA

N75-18050# Polytechnic Inst. of Brooklyn, Farmingdale, N.Y. Dept. of Electrical Engineering.
VAPOR MIRRORS FOR OPTICAL FILTERING Final Report
Benjamin Senitzky and Nicholas Solimene Sep. 1974 60 p refs
(Grant AF-AFOSR-2568-73; AF Proj. 9768)
(AD-A000370; AFOSR-74-1611TR) Avail: NTIS CSCL 20/6

Selective reflection from mercury vapor at oblique incidence is studied at 2537A. A narrowband optical vapor filter based on oblique specular reflection from vapors is described. The device consists of a mercury vapor cell with Brewster angle windows which selectively reflects the 2537A line and transmits other radiation. The bandwidth of the device varies from 0.1A to 1.0A as a function of the mercury vapor pressure. It is used to perform a spectrochemical analysis of mercury in water and also to take a monochromatic photograph of the spatial distribution of excited mercury atoms in a flame. (Modified author abstract) GRA

N75-18051# Texas Technological Univ., Lubbock. Optical Sciences Lab.
DISTRIBUTED REFLECTION OF LIGHT
John D. Reichert 25 Mar. 1974 24 p refs
(Grant AF-AFOSR-2451-73; AF Proj. 9767)
(AD-A000387; TTOSL-DRL-1; AFOSR-74-1709TR) Avail: NTIS CSCL 20/6

The author has recently discovered a method for reducing the wave equation to quadratures and can give the exact analytic continuation from the WKB regime (slowly varying index of refraction) to the interface extreme (discontinuous index). There was noticed a very special impedance matching strategy (anti-reflective coating) that is far better than the universally used quarter wavelength coating. The coating is not wavelength dependent. The impedance matching profile is called the magic slide because of the way is slips a beam into the bulk medium of an optical element. The magic slide is the unique profile of a spatially varying index of refraction that produces no distributed feedback (distributed reflection) whatsoever. Thus the wave slides free from interface to interface. (Modified author abstract) GRA

N75-18052# Army Foreign Science and Technology Center, Charlottesville, Va.
STATISTICAL THEORY OF LIGHT PROPAGATION IN A TURBULENT MEDIUM (REVIEW)
V. I. Klyatskin and V. I. Tatarskii 14 Jun. 1974 35 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Radiofiz. (Gorki), no. 10, 1972 p 1433-1455
(AD-A000243; FSTC-HT-23-0473-74) Avail: NTIS CSCL 20/6

A study was made concerning the statistical theory of light propagation in a turbulent medium. A parabolic equation which was examined was only valid when back scattering could be disregarded. The theory proposed uses the small value of the longitudinal scale of heterogeneities, as compared with other longitudinal scales of the problem. Many difficulties encountered in the range of strong fluctuations are eliminated in the new theory. GRA

N75-18053# Rock Island Arsenal Lab., Ill. General Thomas J. Rodman Lab.
DESIGN AND CONSTRUCTION OF A COHERENT OPTICAL ADAPTIVE TECHNIQUES ARRAY Final Report
Michael J. Lavan, William K. Cadwallender, and Tice F. DeYoung Aug. 1974 32 p refs
(DA Proj. 1T6-62612-D-459)
(AD-A000634; RIA-R-TR-74-041) Avail: NTIS CSCL 17/8

A Coherent Optical Adaptive Techniques array has been designed and constructed. This array will provide an experimental device to test innovations and developments required for integration of COAT systems with fieldable High Energy Laser (HEL) systems. Author (GRA)

N75-18054# Army Foreign Science and Technology Center, Charlottesville, Va.
RANGE COMPUTATION OF NIGHT VISION DEVICES
S. A. Sukhoparov 6 Apr. 1974 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Priborostr. (Leningrad), v. 15, no. 6, 1972 p 102-105
(AD-A001212; FSTC-HT-23-1661-73) Avail: NTIS CSCL 20/6

A method of calculating the range of night vision devices based on their design parameters and light engineering characteristics is presented. The method allows for the effect on range of atmospheric transparency, scattered beams traveling in the reverse direction, and the like. GRA

N75-18055# Ballistic Research Labs., Aberdeen Proving Ground, Md.
ACOUSTO-OPTIC BEAM SAMPLER. PART 2. GREEN'S FUNCTION SOLUTION TO ACOUSTO-OPTIC INTERACTION PROBLEM Final Report
Peter F. Klon Oct. 1974 68 p refs
(DA Proj. 1T1-61102-A-33e)
(AD-A001553; BRL-1743) Avail: NTIS CSCL 20/6

This part of the Acousto-Optic Beam Sampler, series lays down the formalism behind the Green's function integral approach to solving the acousto-optic scattering problem. The advantage of this formulation which is applicable to gases is shown through developing the solution to the scattering problem for several complicated cases using this Green's function method. These results agree with those obtained by more involved means. In particular, the power of the method is shown in solving the problem for a lossy acoustic interferometer used as the acoustic grating. Also since the Green's function method directly gives only the far field scattering fraction, a reasonable method is outlined for obtaining a form for the near field from the far field form. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N75-18056 Polish Academy of Sciences, Warsaw.
PASSIVITY OF EQUATIONS OF LINEAR ELECTRODYNAMICS OF HOT PLASMA AND THE LANDAU DAMPING [PASYWNOSC ROWNAN LINIOWEJ ELEKTRODYNAMIKI GORACEJ PLASMY A TLUMIENIE LANDAUA]
Andrzej J. Turski 3 Apr. 1973 27 p refs In POLISH
(Rept-19/1973) Avail: Issuing Activity

The energy relations for nonlinear and linear Vlasov-Maxwell equations were compared. It was found that a nonlinear system of equations conserves energy without absorption and without its production. Other topics discussed include electromagnetic fields, lengthwise vibrations, plasma disturbances in the Lorentz equilibrium distribution, electron concentration, Fourier and Laplace transformations, and the theory of distribution.
Transl. by M.J.S.

N75-18057*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DRIFT-FREE MAGNETIC GEOMETRIES IN ADIABATIC MOTION
David P. Stern and Peter Palmadesso (NRL) Feb. 1975 16 p refs Submitted for publication
(NASA-TM-X-70829; X-602-75-15) Avail: NTIS HC $3.25 CSCL 20I

There exist magnetic fields in which particles bouncing between mirror points experience no net first-order guiding center drift. In such fields, even though the instantaneous gradient and curvature drifts are not zero, their total effect integrated over any bounce period vanishes, so that particles merely wobble back and forth around fixed field lines. A general criterion for identifying such fields was developed and a class of two-dimensional examples is described. A different approach applicable to this particular geometry is discussed, from which it appears that drift-free properties might extend to non-adiabatic orbits as well. The theory is applied to the plasma sheet in the earth's magnetotail and observational evidence is presented suggesting that the magnetic field there approaches a driftfree configuration. Author

N75-18058# United Aircraft Corp., East Hartford, Conn. Research Labs.
HIGH BETA CAPTURE AND MIRROR CONFINEMENT OF LASER-PRODUCED PLASMAS Semiannual Report, 1 Jan. - 31 Jul. 1974
A. F. Haught, D. H. Polk, J. T. Woo, W. J. Fader, R. G. Tomlinson, R. A. Jong, W. B. Ard, and A. E. Mensing 31 Jul. 1974 79 p refs
(Contract AT(11-1)-2277)
(COO-2277-4) Avail: NTIS HC $4.75

The program to investigate the use of a dense, mirror confined, laser-produced plasma as the target for an energetic neutral injection beam with the goal of creating and sustaining a high temperature, high density, steady state, mirror confined fusion plasma is discussed. Calculations were carried out which show that the confined laser produced can provide collisional trapping of an injected neutral beam for a time sufficient to allow buildup to a steady state determined by the balance between collisional ionization of the injected neutrals and the plasma scattering losses. Investigations were carried out to improve the reproducibility of high temperature laser plasma production with the larger particles of interest for use as the target in the LITE program. Design features of reduce or eliminate the particle position-focal spot variation identified as the source of the problem were incorporated in the LITE experimental system. Author (NSA)

N75-18059# Sandia Labs., Albuquerque, N.Mex.
SPECTRAL ANALYSIS OF X-RAYS FROM LASER INDUCED PLASMAS
J. F. Cuderman and K. M. Glibert 7 Aug. 1974 10 p refs Presented at 23d Ann. Conf. on Appl. of X-ray Analysis, Denver, 7 Aug. 1974 Sponsored by AEC
(SLA-74-5242; Conf-740809-1) Avail: NTIS HC $3.25

Laser interaction experiments were conducted on four-beam laser system. In these experiments, pulses of 1.06 microns light of up to 50 J each were focused in a tetrahedral geometry onto CD2 microspheres. A 22-channel X-ray spectrometer which utilizes silicon diodes with appropriate K-edge prefilters was used for X-ray measurements. Typically, bremsstrahlung recombination spectra were observed in the photon regime below about 5 keV. The electron temperatures for this part of the spectrum ranged from a few hundred eV to 1 keV with up to 15 percent of the total laser energy converted to X rays. Less than one percent of the total energy emitted as X rays appeared in the energy regime above 5 keV. Author (NSA)

N75-18060# Oak Ridge National Lab., Tenn.
EQUILIBRIUM AND STABILITY OF ELLIPTICAL CROSS SECTION TOKAMAK
E. G. Harris Sep. 1974 26 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4666) Avail: NTIS HC $3.75

If a cylindrical column of plasma in a uniform axial magnetic field carries a uniform current density parallel to the axis and is surrounded by a perfectly conducting cylindrical shell of elliptic cross section, then the magnetic surfaces are concentric similar elliptic cylinders. If this cylinder is now bent into a torus of large aspect ratio, then to first order in the inverse aspect ratio, the magnetic surfaces retain their shape but are shifted relative to one another. The amount of this shift is calculated. Localized flute instabilities of the Suydam type are stabilized by the toroidal curvature. The physical origin of this stabilization is the line tying of regions of bad curvature to regions of good curvature. A stability criterion is calculated. The effect of finite conductivity on this stabilization mechanism is evaluated and shown to be unimportant. Author (NSA)

N75-18061# Oak Ridge National Lab., Tenn.
SHIELDING DESIGN CALCULATIONS FOR ORMAK-F/BX
T. A. Gabriel, R. T. Santoro, and W. W. Engle, Jr. Aug. 1974 35 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4619) Avail: NTIS HC $3.75

Calculations are presented which are oriented toward the initial shielding design for the ORMAK-F/BX, the ORNL version of a first-generation injection-heated D-T (Wetwood) burning TOKAMAK-type thermonuclear reactor. The calculations include heating rates in the reactor system with special interest on the heating in the superconducting magnet regions, radiation-damage studies in insulating and current-conducting material, shield and interior wall activation and personnel dosimetry, building and wall composition and thickness, and void-streaming problems associated with entry ports into the reactor plasma region.
Author (NSA)

N75-18062# Maryland Univ., College Park. Inst. for Fluid Dynamics and Applied Mathematics.

INVESTIGATION OF UNIVERSAL PLASMA INSTABILITIES
Annual Progress Report
1 Jun. 1974 11 p
(Contract AT(40-1)-3405)
(TID-26639; APR-9) Avail: NTIS HC $3.25

Turbulence in collisionless plasma, anomalous plasma resistivity, and catalytic plasma heating are examined. Catalytic heating describes the enhancement of the ohmic heating in a Tokamak device caused by increasing the ohmic resistance of the plasma by artificial means. Other research on plasma measurements and instrumentation is described. A program for measuring the conductivity of anisotropic plasma is discussed. Summaries are also given for the following research areas: (1) parametric excitation of ion-acoustic waves, (2) nonlinear pulling effects in beam-plasma interactions, and (3) nonlinear saturation of aperiodic plasma instabilities. Author (NSA)

N75-18063# California Univ., Livermore. Lawrence Livermore Lab.
X-RAY ANALYSIS FOR ELECTRON BEAM ENHANCEMENT IN THE PLASMA FOCUS DEVICE
R. L. Gullickson and R. H. Barlett 2 Aug. 1974 15 p refs Presented at 23d Ann. Conf. on Appl. of X-ray Analysis, Denver, 7 Aug. 1974 Sponsored by AEC
(UCRL-75910; Conf-740809-3) Avail: NTIS HC $3.25

The plasma focus device, a form of linear pinch discharge, produces an intense X-ray and neutron burst from a magnetically heated dense plasma. Rapidly changing magnetic fields at pinch time generate large axial electric fields which accelerate electrons and ions. In the experiments reported here the X-ray production during the plasma pinch of a 96 kilojoule (at 20 kV) plasma focus device was measured. The purpose of these experiments was to evaluate the energy in accelerated electrons in the plasma focus device and to learn how to enhance these electron bursts. Well focused, megampere electron beams at a few hundred kilovolts, lasting less than 10 nanoseconds have applications in fusionable pellet heating experiments. Author (NSA)

N75-18064# Los Alamos Scientific Lab., N.Mex.
MAGNETICALLY PROTECTED FIRST WALL FOR A LASER-INDUCED THERMONUCLEAR REACTION
J. J. Devaney Jul. 1974 6 p refs
(Contract W-7405-eng-36)
(LA-5699-MS) Avail: NTIS HC $3.25

A modest magnetic field (3-kG) is found to protect a cylindrical wall (240-cm radius) against both the alpha pulse and the DT debris plasma from a laser induced thermonuclear microexplosion (100-MJ). The calculations indicate that the Debye lengths are sufficiently small compared to the minimum possible dimensions so that both the alpha particles and the debris behave collectively. The explosion compresses the magnetic field to as much as 21 kG against a negligible resistance coil or cylindrical sleeve. Expansions from 102 to 222 cm are possible depending on the residual gas density. The expanding plasmas are demonstrated to be weakly stable over a large part of their expansion. The instabilities that do develop are slow, allowing time for adequate pressure relief at the ends. Author (NSA)

N75-18065# United Kingdom Atomic Energy Authority, Culham (England).
COMPUTATION OF MHD EQUILIBRIA IN TOKAMAK
C. L. Thomas and F. A. Haas Jan. 1974 16 p refs
(CLM-R-133) Avail: AEC Depository Libraries HC $4.00; UK 50p

A code (TOPE) was written to study magnetohydrodynamic equilibria in Tokamak. Four different models of the equilibrium and the numerical techniques appropriate to each are considered. Where possible, asymptotic analyses were developed, and used (a) to elucidate the qualitative features of the models, and (b) to check the code. The results are presented as a series of examples. Author (NSA)

N75-18066# United Kingdom Atomic Energy Authority, Culham (England).
SUMMARY OF CONTAINMENT EXPERIMENTS ON THE PROTO-CLEO STELLARATOR
D. J. Lees May 1974 17 p refs
(CLM-R-135) Avail: AEC Depository Libraries HC $4.00; UK 50p

The importance of fluctuations on plasma containment is discussed and an attempt made to arrive at momentum balance for the ions and electrons. It is concluded that although plasma can be contained for periods as long as expected on the basis of loss solely by collisions, it cannot be conclusively demonstrated that this is the sole mechanism of plasma loss, since evidence for the existence of the diffusion driven current cannot be found. Author (NSA)

N75-18067# Ecole Polytechnique Federale de Lausanne (Switzerland). Centre de Recherches en Physique des Plasmas.
A NEW FINITE ELEMENT APPROACH TO THE NORMAL MODE ANALYSIS IN MAGNETOHYDRODYNAMICS
K. Appert, D. Berger, R. Gruber, and J. Rappaz Jun. 1974 27 p refs Sponsored by the Swiss NSF
(LRP-83/74) Avail: NTIS HC $3.75

The eigenvalue problem arising in the one-dimensional normal mode analysis of fixed boundary magnetohydrodynamic stability was solved by a finite element method. Piecewise constant, discontinuous basic functions were used for two components of the displacement vector because this permits an accurate representation of the nearly divergence-free property of the modes being treated. In spite of the simple basic functions, the accuracy is greatly improved compared to that obtained with piecewise linear, continuous basic functions. Important features of the spectrum, such as infinitely degenerated eigenvalues, accumulation points, and continua are well represented by the method. Author (ESRO)

N75-18068# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SECTION SEVEN. CALCULATIONAL METHODS AND THEORY OF NEAR-ELECTRODE BOUNDARY LAYERS: CALCULATING TWO-DIMENSIONAL NONSTATIONARY PLASMA FLOWS IN CHANNELS
A. I. Morozov and V. V. Paleichik 22 Oct. 1974 11 p refs Transl. into ENGLISH from Plazmennye Uskoriteli (Moscow), 1973 p 251-254
(FTD Proj. T74-0403)
(AD-A000642; FTD-HT-23-1089-74) Avail: NTIS CSCL 20/9

Presented in the report are some new results from numerical research on the so-called compression plasma flows in coaxial channels, i.e., flows during which intensive constriction of the plasma on the channel axis is observed. GRA

N75-18069# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF ABLATION OF DIELECTRIC BY SLIDING DISCHARGE IN PULSED ACCELERATORS
B. I. Dmitriienko and L. V. Leskov 22 Oct. 1974 11 p Transl. into ENGLISH from the monograph "Plazmennye Uskoriteli" Moscow, 1973 p 230-233
(AD-A000643; FTD-HT-23-1085-74) Avail: NTIS CSCL 20/9

To understand the physical processes which occur in pulsed plasma accelerators the disintegration characteristics of the plasma-forming dielectric must be understood. Experimental studies were conducted on accelerators having conical and coaxial electrode geometry. GRA

N75-18070# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DISINTEGRATION OF ELECTRODES IN PULSED PLASMA ACCELERATORS
B. I. Dmitrienko and L. V. Leskov 23 Oct. 1974 13 p ref Transl. into ENGLISH from the book "Plazmennye Uskoriteli" Moscow, Izd vo Mashinostroyeniye, 1973 p 225-228
(FTD Proj. T74-04-03)
(AD-A000641; FTD-HT-23-1083-74) Avail: NTIS CSCL 20/9

The erosion of copper electrodes in pulsed plasma accelerators of conical and coaxial geometry with a solid dielectric - polytetrafluoroethylene-4 - was studied. The main purpose of the present article is to establish the qualitative patterns of electrode disintegration in pulsed plasma accelerators. GRA

N75-18071# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MAGNETIC MEASUREMENTS IN AXISYMMETRICAL STRONG CURRENT DISCHARGE

V. Yu. Prikhodov 4 Oct. 1974 12 p refs Transl. into ENGLISH from the book "Plazmennye Uskoriteli" Moscow, Izd vo Mashinostroyeniye, 1973 p 139-141

(AD-A000141; FTD-HT-23-1064-74) Avail: NTIS

A magnetic measurement system and its use to measure axisymmetric current discharge in a plasma are described. The system's ability to be cooled and moved during the measuring process was stressed. E.H.W.

N75-18072# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

OBTAINING PULSED PLASMA FLOWS IN COAXIAL PLASMA ACCELERATOR WITH EROSION OF DIELECTRIC

A. M. Andrianov and Yu. A. Alekseev Oct. 1974 10 p refs Transl. into ENGLISH from the book "Plazmennye Uskoriteli" Moscow, Izd vo Mashinostroyeniye, 1973 p 198-200

(AD-A000142; FTD-HT-23-1075-74) Avail: NTIS CSCL 20/9

Electromagnetic pulsed accelerators with dielectric erosion operating at powers of approximately 10 to the 8th power W are used for plasma acceleration. Such accelerators have proven to be effective devices in which a considerable portion of the energy originally stored in the capacitor bank is converted into kinetic plasma energy. Presented in the present work are some results of a study on pulsed plasma flows, which were obtained by means of such accelerators at powers approximately 10 to the 10th power W. GRA

N75-18073# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF PLASMA FOCUS IN COAXIAL ACCELERATOR WITH PRE-IONIZATION OF GAS

I. F. Kvartskhava and E. Yu. Khautiev 3 Oct. 1974 12 p refs Transl. into ENGLISH from the book "Plazmennye Uskoriteli" Moscow, Izd vo Mashinostroyeniye, 1973 p 247-250

(FTD Proj. T74-04-03)

(AD-A000145; FTD-HT-23-1088-74) Avail: NTIS CSCL 20/9

Several possible direct applications of coaxial electrodynamic plasma accelerators for thermonuclear purposes have recently been discovered. It appears that when the accelerating current beyond the end of the central electrodes has sufficiently high levels a plasma focus is formed which is distinguished by its high plasma density and temperature as well as by its significant yield of thermonuclear neutrons. The authors examine the results obtained from an investigation of the main properties of the plasma focus in a system with a preionized gas, achieved by means of an inductive electrical field. GRA

N75-18074# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

QUALITATIVE STUDY OF STRUCTURE OF ACCELERATED PLASMA FLOW BY ARGON MARKER METHOD

A. Kh. Kadymov 4 Oct. 1974 13 p refs Transl. into ENGLISH from the book "Plazmennye Uskoriteli" Moscow, Izd vo Mashinostroyeniye, 1973 p 274-278

(FTD Proj. T74-04-03)

(AD-A000149; FTD-HT-23-1095-74) Avail: NTIS CSCL 20/9

A method similar to that used in hydrodynamics and aerodynamics for flow visualization was used to qualitatively study the structure of a flow in a quasi-stationary sectioned coaxial accelerator. Other topics discussed include ion acceleration, spectrograms, nitrogen supply modes, and glow intensity. M.J.S.

N75-18075# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EFFECT OF NEAR-ELECTRODE PROCESSES ON BEHAVIOR OF PLASMA IN ELECTRODYNAMIC ACCELERATORS

I. F. Kvartskhava and N. G. Reshetnyak 22 Oct. 1974 15 p refs Transl. into ENGLISH from the monograph "Plazmennye Uskoriteli" Moscow, 1973 p 207-211

(AD-A000351; FTD-MT-23-1078-74) Avail: NTIS CSCL 10/2

Experiments were conducted with a coaxial accelerator on the behavior of plasma. In the pinch interval of the central anode, the plasma is compressed more intensely than in the pinch interval of the central cathode. The antiampere movements of the cathode spots observed in quasi-static discharges are interpreted. N.E.R.

N75-18076# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CORPUSCULAR DIAGNOSTIC METHODS FOR PLASMA IN PULSED COAXIAL ACCELERATOR

A. A. Kalmykov and A. D. Timofeev 11 Oct. 1974 12 p refs Transl. into ENGLISH from the book "Plazmennye Uskoriteli" Moscow, Izd vo Mashinostroyeniye, 1973 p 278-281

(FTD Proj. T74-04-03)

(AD-A000150; FTD-HT-23-1096-74) Avail: NTIS CSCL 20/9

In studying plasma acceleration processes the main parameters of the plasma and their time change are of particular interest. Such measurements enable the authors to plot a rather complete picture of the process and compare it to theoretical models. In this work the methods of corpuscular diagnostics have been used to study the processes in the pulsed plasma accelerator described in another paper. GRA

N75-18077# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

WORK OF COAXIAL ACCELERATION IN DENSE AND HIGH ENERGY PLASMA GENERATING REGIMES

I. M. Zolototrubov and Yu. M. Novikov 22 Oct. 1974 13 p refs Transl. into ENGLISH from Plazmennye Uskoriteli (Moscow), 1973 p 214-218

(FTD Proj. T74-04-03)

(AD-A000639; FTD-HT-23-1080-74) Avail: NTIS CSCL 20/9

The dense plasma created in the coaxial accelerator which was achieved through negative polarity of the control electrode was studied. It was found that (1) the moment at which maximum density and intensive emission develop from high energy ion and soft X-ray plasma coincides with the maximum drift; (2) the duration of soft X-ray and high energy ion pulses is approximately 0.6 to 0.8 microseconds; and (3) the region which emits ions of the highest energy is located 6 to 10 cm from the irradiation unit, and coincides with the soft X-ray radiative unit. F.O.S.

N75-18078# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXPERIMENTAL DETERMINATION OF VELOCITY CHARACTERISTICS OF PULSED EROSION ACCELERATOR

V. Ya. Gubarev and N. P. Kozlov 22 Oct. 1974 11 p refs Transl. into ENGLISH from Plazmennye Uskoriteli (Moscow), 1973 p 211-214

(FTD Proj. T74-04-03)

(AD-A000638; FTD-HT-23-1079-74) Avail: NTIS CSCL 20/9

In pulsed plasma accelerators in which the dielectric is eroded a distributed discharge may develop under certain conditions, and the accelerated plasma formation will be the plasma stream which is discharged from the accelerator. Energy characteristics studies are in this case insufficient. There must be additional studies on the velocity characteristics of the stream - time distribution of velocities in stream and aperture angle of stream. Experimental studies were performed on a pulsed erosion plasma accelerating model with coaxial geometry. GRA

N75-18079# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ION ACCELERATION MECHANISM IN CURRENT LAYER IN CASE WHERE INSTABILITY DEVELOPS

V. M. Arefev and L. V. Leskov 4 Oct. 1974 14 p refs Transl. into ENGLISH from Plazmennye Uskoriteli (Moscow), 1973 p 191-195

(FTD Proj. T74-04-03)

(AD-A000637; FTD-HT-23-1073-74) Avail: NTIS CSCL 20/9

In experiments on nonstationary plasma acceleration it was established that under certain conditions behind the current front turbulent processes develop which lead to high-frequency oscillations, anomalous plasma resistance, and the appearance of fast particles whose energy greatly exceeds the applied potential difference. The paper presents a theoretical analysis of the current instabilities which develop when a plasma is accelerated. GRA

N75-18080# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

RADIANT FLUXES FROM ANODE IN HEAVY CURRENT DISCHARGE
N. B. Lappo and A. A. Portnikov 4 Oct. 1974 13 p refs Transl. into ENGLISH from Plazmennye Uskoriteli (Moscow), 1973 p 179-182
(FTD Proj. T74-04-03)
(AD-A000636; FTD-HT-23-1071-74) Avail: NTIS CSCL 20/9

To analyze the near-electrode processes (for both the cathode and the anode), the kinetic probing method is used. The magnitude and the sign of the near-anode drop are determined by electron or ion enrichment of the near-anode layer, generation rates, and the disappearance of positive ions. It was found that as the current grows, the negative anode drop diminishes, changing its sign when the critical current is reached. M.J.S.

N75-18081# Innsbruck Univ. (Austria). Inst. for Theoretical Physics.
STUDY OF THE MHD INSTABILITIES OF A CYLINDRICAL BELT PINCH USING THE FINITE ELEMENT METHOD
L. R. T. Gardner and G. A. Gardner 25 Jul. 1974 22 p refs (Contract F44620-73-C-0016; AF Proj. 9752)
(AD-A000540; UNICP-SR-103; AFOSR-74-1711TR) Avail: NTIS CSCL 20/9

The hydromagnetic stability of a cylindrical pinch of rectangular cross section is studied numerically using the finite element method. The plasma is subdivided into a number of rectangular elements within each of which the perturbations are expressed in terms of nodal values which are taken as parameters of a Lagrangian. Minimizing the Lagrangian with respect to these variables produces an eigenvalue problem. The stability of the pinch is determined from the eigenvalues. Author (GRA)

N75-18082# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY ON QUASI-STATIONARY PLASMA ACCELERATORS
L. V. Leskov and A. M. Malakhov 4 Oct. 1974 12 p refs Transl. into ENGLISH from the book "Plazmennye UskoriteI" Moscow, Izd vo Mashinostroyeniye, 1973 p 221-224
(FTD Proj. T74-04-03)
(AD-A000143; FTD-HT-23-1082-74) Avail: NTIS CSCL 20/9

It has been established that the discharge in a pulsed plasma accelerator consists of a number of consecutive stages, part of which have a quasi-stationary nature. This is because the time during which the plasma parameters change in each stage is considerably greater than the transit time of the ions. It is interesting to compare the work of a pulsed accelerator in this regime with a regime where the length of the acceleration stage considerably exceeds the characteristic times of the other stages and is close to total discharge time. Presented in the paper are results from a study on such a quasi-stationary accelerator (discharge time tau sup p = 150-4000 microseconds), and a comparison is made with a standard pulsed accelerator (tau sup p = 15 microseconds). GRA

N75-18083# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ITERATION METHOD FOR EQUATIONS CALCULATING TWO-DIMENSIONAL MHD
I. N. Ostretsov and V. A. Petrosov 22 Oct. 1974 12 p refs Transl. into ENGLISH from the book "Plazmennye Uskoriteli" Moscow, Izd vo Mashinostroyeniye, 1973 p 254-257
(FTD Proj. T74-04-03)
(AD-A000146; FTD-HT-23-1090-74) Avail: NTIS CSCL 20/9

An iteration method is described for solving two-dimensional MHD problems for various magnetic Reynolds numbers, exchange parameters, and interaction parameters. The system was derived into two subsystems containing the equations describing the electrodynamic and gas dynamic quantities, and then a convergent iteration process was constructed. F.O.S.

N75-18084# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INTERFEROMETRY OF DENSE PLASMA FLOWS
A. M. Andrianov and Yu. A. Alekseev 4 Oct. 1974 11 p refs Transl. into ENGLISH from the book "Plazmennye Uskoriteli" Moscow, 1973 p 272-274
(FTD Proj. T74-04-03)
(AD-A000148; FTD-HT-23-1094-74) Avail: NTIS CSCL 20/9

The paper discusses results of interferometric measurements of the distribution of the electron concentration in a plasma flow obtained by means of an electromagnetic plasma accelerator with erosion of the dielectric. GRA

N75-18085# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
USING THOMSON MASS SPECTROGRAPH WITH ELECTRON OPTICAL REGISTER FOR STUDYING ACCELERATION MECHANISM OF PLASMA CLUSTERS
M. I. Pergament and A. I. Yaroslavskii 4 Oct. 1974 12 p Transl. into ENGLISH from the book "Plazmennye Uskoriteli" Moscow, Izd vo Mashinostroyeniye, 1971 p 268-271
(AD-A000147; FTD-HT-23-1093-74) Avail: NTIS CSCL 20/9

A Thomson mass spectrograph was used to study plasma clusters in a coaxial injector. Instruments with high time and space resolution were used; this included electron optical high speed slow motion cameras. The energy distribution of deuterium ions were also studied, considering integral distribution during discharge and time clamping of deuteron escape moment. J.A.M.

N75-18086# Army Foreign Science and Technology Center, Charlottesville, Va.
INDUCTION MAGNETOHYDRODYNAMIC MACHINES WITH A LIQUID METAL WORKING BODY
A. I. Voldek 22 Aug. 1974 330 p refs Transl. into ENGLISH from the monograph "Induklsionnye Magnitogidrodinamacheskie s Zhidkomelallicheskim Rabochim Telom" Leningrad, 1970 272 p
(AD-A000194; FSTC-HT-23-1852-73) Avail: NTIS CSCL 20/9

Several types of induction magnetohydrodynamic machines which work with liquid metal as the moving mass are discussed. Information presented deals both with theoretical calculations, using machines with infinite parameters and dimensions, and with practical ones, outlining what can be expected and methods of compensation. The work deals with the different characteristics of electromagnetic fields developed by different types of windings and inductors, and presents mathematical relationships describing them. GRA

N75-18087# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
MAGNETIC SHEAR AND HELICAL-FIELD AND CONDUCTING WALL FEEDBACK STABILIZATION FOR TOROIDAL PLASMA CONFINEMENT (THETA PINCH, TOKAMAK) Final Report
Benjamin M. Ma Apr. 1974 78 p refs
(Grant AF-AFOSR-2072-71; AF Proj. 9752)
(AD-A000023; ISU-ERI-AMES-74130; AFOSR-74-1601TR) Avail: NTIS CSCL 20/9

Based on the wave packet model, the magnetic shear required and the stability criteria for the convective drift instabilities driven by particle density gradient and electron temperature gradient are obtained and compared to existing experimental data. From some basic assumptions of magnetic flux, energy principle, and the present ordering and expansion techniques, the theoretical displacement, equilibrium, required magnetic (shear) field, and force balance equations of the plasma are derived. Theoretical results calculated from these equations and experimental data measured from the 5-meter Scyllac sector are in excellent agreement. The block diagram of helical-field feedback stabilization using the theoretical equations is proposed for the Scyllac experiments or for computer simulation. (Modified author abstract) GRA

N75-18088# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MOVABLE LAYERS. DOUBLE LAYERS
I. M. Chapnik 25 Sep. 1974 12 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Sibirskoe Otd., no. 2, Ser. Tekhn. Nauk, no. 1, 1965 p 86-90
(AD-A000133; FTD-HC-23-1803-74) Avail: NTIS CSCL 20/9

The results of experiments on movable and double plasma layers are discussed. Experiments show that (1) the layer lengths coincide with the length of the fixed layers; (2) the factors

producing the fixed stratification cause a periodic structure of the column parameters in movable layers; and (3) the movement of the movable layers and the change in the layer length at high frequencies are caused by oscillating boundary conditions at one end of the column. M.J.S.

N75-18089# Illinois Univ., Urbana. Charged Particle Research Lab.
CHARGED COLLOIDAL PARTICLES FOR CONTROLLED NUCLEAR REACTORS Final Report
Charles D. Hendricks Aug. 1974 30 p refs
(Grant AF-AFOSR-2481-74; AF Proj. 9752)
(AD-A000543; CPRL-1-74; UILU-ENG-74-2551; AFOSR-74-1584TR) Avail: NTIS CSCL 20/9

Charge and mass loss of macroscopic particles in a weakly ionized plasma were measured. The evaporation and combustion theories of droplets were surveyed and the interaction of charged droplets with the ions in a flame was investigated. Cryogenic techniques in producing particles of oxygen, hydrogen, argon and other materials in vacuum were developed. These particles were injected into plasmas as a diagnostic tool to measure plasma parameters. A dense plasma focus device is under construction to investigate the possibility of increasing the output of pulsed X-rays from the DPF device by injecting particles into the focus region. Author (GRA)

N75-18090# California Univ., Los Angeles. School of Engineering and Applied Science.
EXPLOSIVE RAY-SOLUTIONS OF NONLINEAR WAVE-WAVE INTERACTING SYSTEMS
P. K. C. Wang Aug. 1974 24 p refs
(Grant AF-AFOSR-2662-74; AF Proj. 9752)
(AD-A000581; UCLA-ENG-7469; AFOSR-74-1656TR) Avail: NTIS CSCL 20/9

Sufficient conditions for the existence of ray solutions of nonlinear wave-wave interacting systems are established. It is shown that along these solutions, the phases of the waves are time-invariant and the wave-energy transfer is always unidirectional or irreversible. Also, under certain conditions, the ray solutions are explosive. The applications of the main results to specific forms of two-wave and three-wave nonlinear interacting systems are discussed. Author (GRA)

N75-18091# Army Foreign Science and Technology Center, Charlottesville, Va.
CALCULATION OF THERMAL INTERACTION BETWEEN ARC COLUMN AND ELECTRODES
S. M. Krizhanskii 26 Mar. 1974 14 p refs Transl. into ENGLISH from Inzh. Fiz. Zh., Akad. Nauk Belorvssk. SSR (Minsk), v. 20, no. 2, 1971 p 299-305
(AD-A001205; FSTC-HT-23-1426-73) Avail: NTIS CSCL 20/9

Two-dimensional nonlinear boundary-value problems on temperature distribution in an arc column with account for the cooling effect of electrodes is stated. A sharp temperature drop near the electrodes is treated as a thermal boundary layer of a column. The accuracy of an approximate boundary condition is discussed. An approximate solution to the problem stated is found by the method of reducing to an ordinary differential equation. Expressions are obtained for distribution of thermal potential and heat flux along the axis. The numerical calculation confirms existence of boundary layers which are most apparent in the curves of fields and potential. GRA

N75-18092# Army Foreign Science and Technology Center, Charlottesville, Va.
THE ROLE OF PHOTOEMISSION IN THE MECHANISM OF DISCHARGE FROM A HOLLOW CATHODE
V. M. Tkachenko and V. B. Tyutyunnik 14 Jan. 1974 7 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Radiofiz. (Gorki), v. 15, no. 4, 1972 p 631-633
(AD-A001481; FSTC-HT-23-1531-73) Avail: NTIS CSCL 20/9

The paper investigates the voltage of firing and some characteristics of the discharge glowing in helium with a cylindrical hollow cathode in the magnetic field. The role of photoemission from the cathode in the discharge process is discussed on the basis of comparing the influence of the magnetic field on the electric and optical discharge characteristics. GRA

N75-18093# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ANGULAR SCATTERING OF A MICROWAVE FLOW IN FLUCTUATING PLASMA
L. A. Dushin, A. I. Skibenko, I. P. Fomin, V. A. Pimkin, and V. V. Zinovev 12 Nov. 1974 16 p refs Transl. into ENGLISH from Fiz. Plazmy i Probl. Upravlyaemogo Termoyadern. Sinteza, Akad. Nauk Ukr. SSR, Fiz. Tekhn. Inst. (Moscow), no. 1, 1971 p 52-58
(AD-A001179; FTD-HT-23-2184-74) Avail: NTIS CSCL 20/9

Diffraction scattering on the statistical heterogeneities of dense plasmas was studied. After finding the angles of scattering, the value of the three-dimensional heterogeneity was determined as a function of density. F.O.S.

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N75-18094 British Library Lending Div., Boston Spa (England).
A SUBSTANCE: NEW PROPERTIES
A. Abrikosov and N. Brandt 29 Dec. 1973 4 p Transl. into ENGLISH from Pravda (USSR), 16 Dec. 1973
(BLL-M-23310-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The physical properties of non-gap semiconductors are discussed in terms of energy gap. F.O.S.

N75-18095*# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
OPTICAL INVESTIGATIONS OF NONCRYSTALLINE SEMICONDUCTORS Final Technical Report, 1 Feb. 1970 - 31 Jan. 1973
N. A. Blum, C. Feldman, and K. Moorjani 31 Jan. 1973 90 p refs
(Contract NGR-21-009-033)
(NASA-CR-136762) Avail: NTIS HC $4.75 CSCL 20L

Three areas of investigation into the properties of amorphous silicon and boron are reported: (1) optical properties of elemental amorphous semiconductors; (2) Mossbauer studies of disordered systems; and (3) theoretical aspects of disordered semiconductors. Author

N75-18096# California Univ., Berkeley. Lawrence Berkeley Lab.
EXCITON ENHANCED RAMAN SCATTERING OF LO PHONONS IN TRIGONAL Se
N. Amer, Y. Petroff, Y. R. Shen, and P. Y. Yu Jun. 1974 5 p refs Presented at 12th Intern. Conf. on the Phys. of Semiconductors, Stuttgart, West Germany, 15 Jul. 1974
(Contract W-7405-eng-48)
(LBL-2781; Conf-740722-1) Avail: NTIS HC $3.25

Resonance enhancements in the Raman cross-section of longitudinal optical (LO) phonons in trigonal Se were measured around its excitonic absorption edge at low temperatures. Results are explained in terms of resonant scattering of LO phonons via the Frohlich interaction. Author (NSA)

N75-18097# Utah Univ., Salt Lake City. Dept. of Physics.
ELECTRONIC AND RADIATION DAMAGE PROPERTIES OF RUTILE Final Report, 30 Jun. 1970 - 31 Jul. 1974
John W. DeFord, Owen W. Johnson, and Franz Rosenberger 1974 43 p refs
(Grant DAHC15-73-G-0002; ARPA Order 1610)
(AD-A000229) Avail: NTIS CSCL 20/12

A major goal has been to understand the electronic properties of rutile and to permit investigation of its feasibility as a semiconductor device material. In addition, from a more fundamental standpoint, rutile is an excellent model system for the study of wide gap semiconductors in general. The following studies are reported: Impurity thermodynamics, Defect thermody-

namics. Effects of internal fields on diffusion and distribution of ions, ESR measurements and miscellaneous projects. Results of crystal growth program--Problems encountered in developing chemical vapor technique, Summary of major achievements of the crystal growth program, Plans for future research on growth of TiO2 crystal by chemical vapor transport. GRA

N75-18098# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEM OF THE SURFACE IN SOLID STATE THEORY
F. F. Volkenshtein 4 Oct. 1974 20 p refs Transl. into ENGLISH from the monograph "Problemy Kinetiki i Kataliza. 15. Mekhanizm i Kinetika Geterogennykh Reaktsii" Moscow, 1973 p 65-71
(AD-A000185; FTD-MT-24-1751-74) Avail: NTIS CSCL 20/12

The problems surrounding the breaking of an infinite crystal lattice in solid state theory are discussed. The localization of free carriers and excitons on the surface, the interaction of the surface with space, and environmental effects on crystal properties are considered, along with thin films and finely divided crystals. J.A.M.

N75-18099# Florida State Univ., Tallahassee. Dept. of Physics.
PREPARATION AND CHARACTERIZATION OF SUPERCONDUCTING QUANTUM INTERFERENCE DEVICES Final Report, 16 Sep. 1970 - 15 Sep. 1974
W. G. Moulton 4 Oct. 1974 26 p refs
(Grant AF-AFOSR-1940-70; AF Proj. 9764)
(AD-A000371; AFOSR-74-1723TR) Avail: NTIS CSCL 20/12

The objectives of the research was to prepare magnetic and superconducting materials with unusual properties which will be useful in device applications, and to investigate the properties of these materials. Both experimental and theoretical studies were carried out. Magnetic properties of the rare earth compounds were investigated, and several unusual phenomena were found. Double magnetic phase transitions were observed and studied in cesium nickel trichloride and several other similar crystals. The superconducting properties of the fluoroxy tungsten bronzes were investigated, and a number of new results were obtained. The most recent objectives were to develop low critical current materials useful in new kinds of Josephson devices. (Modified author abstract) GRA

N75-18100# State Univ. of New York, Stony Brook. Dept. of Materials Science.
SURFACE PROPERTIES, SURFACE REACTIONS AND EPITAXIAL GROWTH Final Report, 1 Dec. 1972 - 31 May 1974
F. Jona Jun. 1974 11 p
(Grant AF-AFOSR-2151-72; AF Proj. 9761)
(AD-A000690; AFOSR-74-1715TR) Avail: NTIS CSCL 20/12

Studies of epitaxial systems were continued with the deposition of silicon on the beryllium (0001) surface and of silicon on the molybdenum (001) surface. The atomic arrangements on clean silver (0001) and clean molybdenum (001) surfaces were unveiled. The methods for determination of the vibration amplitudes of surface atoms were successfully tested with a computer experiment and then applied to the clean (001) surface of silicon. The structure of one monolayer of selenium on silver (001) and that of a monolayer of silicon on molybdenum (001) were determined. The structures of overlayers of oxygen, nitrogen and carbon monoxide on the molybdenum (001) surface are presently being studied. (Modified author abstract) GRA

N75-18101# State Univ. of New York, Plattsburgh. Dept. of Physics.
PHOTOCONDUCTIVITY STUDIES ON AN ORGANOMETALLIC LADDER POLYMER, BIS CATENA-POLY METHYLARSENIC
J. E. Lewis and M. Edris 19 Sep. 1974 26 p refs
(Contract N00014-73-A-0450-0001)
(AD-A000282; TR-2) Avail: NTIS CSCL 20/12

Photoconductivity studies on single crystal samples of the organometallic ladder polymer bis (catena-poly(methylarsenic)), (BCPMA), have been made at room temperature in the spectral range 400 - 1700 nm (0.73 - 3.1 eV). All samples exhibited intrinsic photoconductivity behavior for photon energies greater than 1.55 eV. This value of the optical energy gap is in excellent agreement with the thermal energy gap found from electrical conduction studies on the same samples. Below the energy gap substantial impurity photoconduction is seen, probably due to iodine impurities. Explanations are suggested for the flash photoresponse and the subsequent quenching (negative photoconduction) seen in the impurity region, including deep traps and interimpurity hopping recombination. The photoresponse is found to be field dependent and in the extrinsic region is governed by the bulk-limited Poole-Frenkel effect. (Modified author abstract) GRA

N75-18102# Colorado Univ., Boulder. Dept. of Electrical Engineering.
THE EFFECT OF BAND FILLING ON THE WIDTH OF THE MINIGAPS ON LONG PERIOD ONE-DIMENSIONAL SUPERLATTICES Technical Report, Sep. 1973 - Oct. 1974
Herbert Kroemer Oct. 1974 46 p refs
(Contract N00014-67-A-0405-0006; NR Proj. 372-307)
(AD-A001095; TR-1) Avail: NTIS CSCL 20/12

In superlattices with a long period (greater than or approximately equal to 100A) the miniband structure depends noticeably on the number of free electrons present and on how those electrons are distributed in energy. The minigap width between the first and second miniband decreases at first rapidly, then slowly, with an increasing number of electrons in the lowest miniband. For an exactly full first miniband the free-electron dielectric constant for perturbations of the superlattice wavelength is large (the Kohn anomaly) and highly non-linear. Transferring electrons into the second miniband increases the minigap width. For strongly inverted non-equilibrium distributions an electrostatic instability can occur in the band structure under certain extreme conditions. GRA

N75-18103# Army Foreign Science and Technology Center, Charlottesville, Va.
THE CONDUCTION BAND STRUCTURE OF GaAs AlAs ALLOYS
G. A. Sikharulidze and V. S. Kuparadze 26 Mar. 1974 9 p refs Transl. into ENGLISH from Soobsch. Akad. Nauk Gruz. SSR, (Tiflis), v. 65, no. 3, 1972 p 559-562
(AD-A001214; FSTC-HT-23-1789-73) Avail: NTIS CSCL 20/12

On the basis of an absorption-spectra analysis, the conduction band in GaAs-AlAs alloys has been found to have a complex structure. The energy separation between the central conduction band minimum and the higher conduction valley is assumed to be 0.22 eV for alloys with a small mole fraction of AlAs. GRA

N75-18104# Army Foreign Science and Technology Center, Charlottesville, Va.
POSSIBILITY OF ATOMIC MOTION IN SOLIDS UNDER THE ACTION OF THE LASER LIGHT PULSE
L. I. Mirkin 8 Mar. 1974 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Fiz. (USSR), no. 2, 1973 p 106-108
(AD-A001216; FSTC-HT-23-1843-73) Avail: NTIS CSCL 20/2

The object of the research was to demonstrate that atoms can move to new stable positions in solids even in the short duration of the action of the laser light pulse. To accomplish this, it was necessary to select a material in which even very small displacements of atoms from equilibrium positions in the lattice would result in stable and detectable structural transformations. The material selected was an alloy of copper and platinum containing 25 at-% Pt. X-ray diffraction studies showed complete destruction of the simple cubic superstructure after irradiation with laser light. GRA

N75-18105# Pennsylvania Univ., Philadelphia. Final Report, 19 Jun. 1964 - 18 Jun. 1974
RAMAN SPECTROSCOPY OF SOLIDS
Elias Burstein 15 Sep. 1974 34 p refs
(Contract DA-31-124-ARO(D)-239)
(AD-A000912) Avail: NTIS CSCL 20/12

A summary is presented of the major results of experimental and theoretical research, carried out under ARO-Durham auspices, on the scattering of light by elementary excitations in solids.

These include the formulation of the macroscopic theory of Raman scattering by collective excitations, the effects of electric fields and strain on Raman scattering, the macroscopic theory of wave vector dependent Raman scattering by collective excitations, theory of resonance Raman scattering and Raman scattering in opaque solids, the Franz-Keldysh mechanism of electric field induced Raman scattering by optical phonons, surface space charge electric field induced Raman scattering by Longitudinal optical phonons in semiconductors, interband electronic Raman scattering in semimetals and semiconductors, and theory of Raman scattering by surface polaritons.
Author (GRA)

N75-18106# Illinois Univ., Urbana. Coordinated Science Lab.
PHOTOLUMINESCENT PROPERTIES OF Ga As(L-X)P(X) IMPLANTED WITH NITROGEN AND NEON Ph.D. Thesis
Richard Ernest Anderson Aug. 1974 163 p refs
(Contract DAAB07-72-C-0259)
(AD-A000906; R-660; UILU-ENG-74-2226) Avail: NTIS CSCL 20/12

Low temperature photoluminescence from GaAs(1-x)P(x) crystals implanted with nitrogen and neon has been studied. The implanted nitrogen produced photoluminescence spectra confirming the presence of the nitrogen isoelectronic trap after appropriate annealing. Implanted neon did not produce luminescent centers. Both nitrogen and neon implantations introduced lattice damage which severely degraded photoluminescence efficiencies prior to annealing. High temperature annealing was required to remove the effects of the implantation damage and produce optical activity of the implanted nitrogen atoms. In crystals with compositions in the direct bandgap region, certain implanted nitrogen concentrations produced more efficient luminescence than nonimplanted, N-free crystals. In addition, nitrogen concentrations greater than solid solubility were realized, as determined by the spectral characteristics of the photoluminescence. In crystals with indirect bandgap compositions, luminescence from nitrogen implanted crystals compared favorably in intensity with crystals doped conventionally with nitrogen. GRA

N75-18107# California Univ., Berkeley. Dept. of Physics.
NOISE IN JOSEPHSON EFFECT mm-WAVE MIXERS
J. H. Claassen, Y. Taur, and P. L. Richards 30 Sep. 1974 6 p refs Presented at the Appl. Superconductivity Conf., Oakbrook, Ill., Oct. 1974
(Contract N00014-69-A-0200-1056)
(AD-A001027) Avail: NTIS CSCL 09/5

It is shown that point contact Josephson junctions can function as millimeter wave heterodyne mixers with conversion gain. The best results achieved thus far show a single sideband conversion gain of 1.3 and a mixer contribution to the system noise temperature of 54K. Both of these results are approximately 5 times better than the best published figures for cooled Schottky barrier diode mixers operated at the same frequency. (Modified author abstract) GRA

N75-18108# Lincoln Lab., Mass. Inst. of Tech., Lexington.
UNIFIED MODEL OF THE INSULATOR METAL TRANSITION IN Ti2O3 AND THE HIGH-TEMPERATURE TRANSITION IN V2O3
Herbert J. Zeiger 22 Aug. 1974 44 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-A001546; TR-514; ESD-TR-74-245) Avail: NTIS CSCL 20/12

A unified band-crossing model of the insulator-metal transition in Ti2O3 and the high-temperature transition in V2O3 is presented. The model is based on a Hartree-Fock free-energy calculation including electron-electron Coulomb energy, elastic energy, and band-electron entropy, and taking into account the partial overlap of (e sub g)(pi) bonding and anti-bonding bands. The model calculation is applied to a description of the behavior of lattice parameters, specific heat, Raman frequencies, sound velocity, and magnetic susceptibility through the transition temperature in Ti2O3 and V2O3. The calculated properties of Ti2O3 are found to be at best only in qualitative agreement with experiment, and in the case of the magnetic susceptibility, in serious disagreement. On the other hand, the model predictions are nearly quantitatively correct for many of the properties of V2O3. The Knight shift and nuclear spin relaxation rate of 51V in V2O3 are treated, and found to agree well with experiment. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N75-18109 British Library Lending Div., Boston Spa (England).
RESEARCH INTO THERMAL CONDUCTIVITY WITH VARIABLE THERMAL AND PHYSICAL PARAMETERS UNDER SECOND ORDER BOUNDARY CONDITIONS
Yu. S. Postolnik, V. A. Garanchuk, and V. M. Guba 1974 12 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 6, 1974 p 152-157
(BLL-M-25022-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

An approximate solution is presented to the nonlinear problem of thermal conductivity under second order boundary conditions. The mathematical method used is that of equivalent sources. In the solutons, the problems of the relationship of the coefficient of thermal conductivity, the specific heat capacity and the density of the metal to temperature are approximated by straight line equations. Equations are given for calculating the temperature fields in plates, cylinders, and spheres. Author

N75-18110 British Library Lending Div., Boston Spa (England).
THERMODYNAMIC CHARACTERISTICS OF THE REACTIONS OF SiO2, SiC, SiO AND CO FORMATION FROM THE ELEMENTS
D. M. Laptev, V. V. Vasilev, V. G. Mizin, G. V. Serov, and M. S. Khrushchev 1974 14 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chernaya Met. (Moscow), v. 8, 1974 p 13-18
(BLL-M-25054-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Thermodynamic vaues for the formation of the compounds silicon dioxide, silicon carbide, silicon oxide and carbon monoxide from the elements have been calculated from more accurate reference data in the range 298 to 3073 K for every 100 deg and at phase transformation points. The results of the calculations are tabulated. Author

N75-18111*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PERFORMANCE OF A HYPERSONIC HOT FUSELAGE STRUCTURE WITH A CARBON DIOXIDE FROST PROJECTED, NONINTEGRAL CRYOGENIC TANK
Ellsworth L. Sharpe and L. Robert Jackson Washington Mar. 1975 50 p refs
(NASA-TN-D-7799; L-9711) Avail: NTIS HC $3.75 CSCL 20M

A model which consisted of a hot structure and a nonintegral tank protected by a carbon dioxide frost thermal protection system was tested under the following conditions: (1) room temperature loading and (2) heating and loading corresponding to the Mach 8 flight of an air-breathing launch vehicle. In the simulated flight tests, liquid nitrogen inside the tank was withdrawn at the rate fuel would be consumed. Prior to each simulated flight test, carbon dioxide was cryodeposited in the insulation surrounding the tank; during the tests, subliming CO2 frost absorbed heat and provided a purge gas for the space between the tank and the structure. A method of flame spraying the joints between panels with a nickel-aluminum material was developed to prevent excessive leakage of the purge gas through the outer structure. The tests indicated that the hot structure (with a joint repaired by riveting), the nonintegral tank and suspension system, and the carbon dioxide frost thermal protection system provide a workable concept with predictable performance. Author

N75-18112# California Univ., Berkeley. Lawrence Berkeley Lab.
MICROSECOND PULSE TECHNIQUE FOR HEAT CAPACITY MEASUREMENT Ph.D. Thesis
T. H. Chen May 1974 82 p refs
(Contract W-7405-eng-48)
(LBL-2574) Avail: NTIS HC $4.75

A refined thermal pulsing technique for measuring heat capacity of metals at high pressure is described. The technique originally involved measurements of the rate of temperature rise in the sample when a constant current power input was added for a constant current power input was added for a short period of time. When the technique was applied to a highly conducting sample, the results were found to be poor because the heat leak from the sample to the surrounding medium was appreciable. Efforts were therefore directed towards improving measuring techniques and refining mathematical equations to account for the heat leakage. The technique was improved to render an essentially constant heat capacity of aluminum with pressure at room temperature. The major limitation at present still lies in the lack of quality measuring devices. Heat capacity of iron in vacuum between room temperature and 1100 K was measured with the thermal pulsing technique to demonstrate its versatility. Author (NSA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N75-18113 Polish Academy of Sciences, Warsaw.
SEQUENTIAL IDENTIFICATION OF VOWELS [SEKWENCYJNA IDENTYFIKACJA SAMOGLOSEK]
Wiktor Jassem, Miroslaw Krzsko, and Andrzej Dyczkowski 5 Feb. 1974 29 p refs In POLISH
(Rept-6/1974) Avail: Issuing Activity

A method was investigated for determining the possibility of using frequency measurements of formant vowels for automatic speech recognition. It was found that the sequential method of classification can be used to find the number of variables (in this case, frequencies of formants) and the sequency of their measurements. The open sequential method is based on a reliability quotient and is applied to data acquisition from previously-conducted measurements. All mutations of the four vowel formants are presented. Transl. by M.J.S.

N75-18114# Committee on the Judiciary (U. S. House).
NASA'S EQUAL OPPORTUNITY PROGRAM
Washington GPO 1975 277 p refs Hearings before Subcomm. on Civil Rights and Constitutional Rights of Comm. on The Judiciary, 93d Congr., 2d Sess., 13-14 Mar. 1974
(GPO-44-377) Avail: Subcomm. on Civil Rights and Constitutional Rights CSCL 05K

Testimony concerning the employment of minorities, and women in the NASA programs is reported with emphasis on the EEO program. The buddy system and majority group attitudes are discussed as barriers to an effective EEO program. Upgrading concepts are also discussed. F.O.S.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N75-18115*# Wright (Philip) Associates, Storrs, Conn.
THE FEASIBILITY OF A UNIFIED ROLE FOR NASA REGIONAL DISSEMINATION CENTERS AND TECHNOLOGY APPLICATION TEAMS Final Report
Sep. 1974 138 p refs
(Contract NASw-2597)
(NASA-CR-142116) Avail: NTIS HC $5.75 CSCL 05A

Insights and recommendations arising from a study of the feasibility of combining the NASA Regional Dissemination Center (RDC) and Technology Application Team (Tateam) roles to form Regional Application Centers (RADC's) are presented. The apparent convergence of the functions of RDC's and Tateams is demonstrated and strongly supportive of the primary recommendation that an applications function be added to those already being performed by the RDC's. The basis of a national network for technology transfer and public and private sector problem solving is shown to exist, the skeleton of which is an interactive network of Regional Application Centers and NASA Field Centers. The feasibility of developing and extending this network is considered and the detailed ramifications of so doing are discussed and the imperatives emphasized. It is hypothesized that such a national network could become relatively independent of NASA funding within five years. Author

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N75-18116*# North Carolina Science and Technology Research Center, Research Triangle Park.
A STUDY OF THE RELATIVE EFFECTIVENESS AND COST OF COMPUTERIZED INFORMATION RETRIEVAL IN THE INTERACTIVE MODE
Frederick O. Smetana, Mary Ann Furniss, and T. Robert Potter Nov. 1974 103 p
(Contract NASw-2721)
(NASA-CR-142206; STR-505) Avail: NTIS HC $5.25 CSCL 05B

Results of a number of experiments to illuminate the relative effectiveness and costs of computerized information retrieval in the interactive mode are reported. It was found that for equal time spent in preparing the search strategy, the batch and interactive modes gave approximately equal recall and relevance. The interactive mode however encourages the searcher to devote more time to the task and therefore usually yields improved output. Engineering costs as a result are higher in this mode. Estimates of associated hardware costs also indicate that operation in this mode is more expensive. Skilled RECON users like the rapid feedback and additional features offered by this mode if they are not constrained by considerations of cost. Author

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N75-18117 British Library Lending Div., Boston Spa (England).
THE INCREASE IN THE OXYGEN CONTENT OF WATER IN THE RIVERS MAAS, AMER AND DONGE DUE TO THE PRESENCE OF AMER POWER STATION (HOLLAND)
L. J. Clement 4 Mar. 1974 14 p Transl. into ENGLISH from Elektrotechniek, v. 50, no. 21, 12 Oct. 1972 p 838-842
(BLL-CE-Trans-6192-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Cooling water is used to condense and cool the steam generated in the main and feed pump turbines of the Amer Station. After passing through the condensers the cooling water is returned to the Amer via three effluent channels containing adjustable weirs. Having passed over the weirs the water falls with some force so as to produce aeration. Percentage increases in dissolved oxygen concentrations which occurred at various dissolved oxygen and temperature levels found in the water taken in for cooling purposes were studied. Measurements of the oxygen content of the cooling water show that the aeration of the re-entry into the river gives an important and valuable increase of the oxygen content. Author

N75-18118# Federal Aviation Agency, Washington, D.C. Airport Design Branch.
ANALYSIS OF DUAL LANE RUNWAYS Final Report
Carl T. Ball Mar. 1974 61 p
(AD-777914; FAA-RD-73-97) Avail: NTIS HC $3.75

Dual lane runway design criteria, modes of operation, and site selection criteria are developed and evaluated. Analytical efforts were undertaken for high density commercial airports. The basis for the findings and conclusions of the dual lane runway (DLRW) committee are developed. Real time and fast time computer simulations of dual lane runway configuration possibilities and operational strategies were conducted. Center line spacing for dual lane runways and the desirability of a segregated mode of operation were determined. The dual lane analysis included modes of operation where both runways were used for arrivals and one or more runways for departures. A model predicting potential missed approaches was used. Supporting detail is provided for the DLRW report, and the analytical studies are combined and summarized in terms of design, location, and operation. Author

N75-18119# Brookhaven National Lab., Upton, N.Y.
FORCE CALCULATIONS FOR HYBRID (FERRO-NULLFLUX) LOW-DRAG SYSTEMS
G. T. Danby, J. W. Jackson, and J. R. Powell 1974 4 p refs Presented at Intermag Conf., Toronto, Canada, 14 May 1974 Sponsored by AEC
(BNL-18912; Conf-740552-1) Avail: NTIS HC $3.25

A strong-lift large clearance suspension can be produced using the attraction between superconducting train magnets and iron track sheets. A null flux arrangement of track loops interacting with the same train magnets will yield magnetic lift/drag ratios of several hundred, and can be designed to give whatever degree of inherent stability is desired. As an example, lift forces of two tons per foot of vehicle can be achieved with clearances of six of twelve inches, and inherent restoring forces in any direction can be designed in the range of 0.2 to 1 g per inch. Calculations are made of lift, low drag capability would allow the economic high speed transport of freight as well as passengers. Possibilities include transport of bulk materials, piggy-back trucks, and autos with passengers. Author (NSA)

N75-18120# Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
FACTORS INFLUENCING THE TRANSFER OF GOVERNMENT TECHNOLOGY TO THE PRIVATE SECTOR
J. R. McMillan, D. J. Wheeler, M. E. Koons, and A. M. Read 11 Oct. 1974 55 p refs
(Contract W-7405-eng-26)
(UCC-ND-291) Avail: NTIS HC $4.25

A mail questionnaire was designed to evaluate the Industrial Cooperation Bulletins and Supplemental Information Packets now utilized by Union Carbide Corporation to disseminate unclassified technology developed for the Atomic Energy Commission. In-depth information was developed about the experiences of firms that had either implement selected AEC-UCCND technologies made available to the public. Of special interest were the 106 technologies that were publicized in the IC Bulletins at the time the study was made. NSA

N75-18121# Parsons (Ralph M.) Co., Pasadena, Calif.
A STUDY OF THE TRANSPORTATION FACILITATION CENTER CONCEPT Final Report, Sep. 1971 - Sep. 1974
Irwin Blatner Sep. 1974 200 p
(Contract DOT-OS-20224)
(PB-236593/0; Rept-4937-2) Avail: NTIS HC $7.00 CSCL 13B

The study evaluates a concept for the pickup and delivery of small shipments in the urban area. The concept of transportation facilitation centers (TFC) provides a basic network of facilities for pooling shipments, container interchange, transport equipment pooling, and inland consolidation and breakbulk of international air and marine containerized freight. Mandatory and other service opportunities, the market for TFC services, and legal and regulatory restraints to implementing TFC are discussed. A comprehensive economic analysis of freight movement and carrier costs for pickup and delivery of under-1000-pound shipments in the city of Chicago was conducted. The conclusions and findings of the contractor are presented, along with recommendations to facilitate implementation of the concept. GRA

N75-18122# Wisconsin Univ., Milwaukee.
STUDIES IN URBAN TRANSPORTATION. TRANSPORTATION SYSTEMS: NOISE GENERATION AND ABATEMENT
Frank B. Hartl Feb. 1974 143 p refs Sponsored by DOT
(PB-236681/3; UMTA-WI-11-0003-74-2) Avail: NTIS HC $5.75 CSCL 13F

This report deals with the amount and intensity of transportation systems noise generation, along with efforts used to lessen the impact of noise. An introductory discussion of the physics of noise and noise measurement is given to help the reader in understanding how noise impact is analyzed. Transportation planners and designers must be aware of noise assault any proposed system will have on environment. The mandate for this stems from the National Environmental Policy Act of 1969 and the Federal-Aid Highway Act of 1970; the first requires assessment of all Federally funded projects to determine any adverse impacts on environment and the second, aimed at highways that are Federally funded, requires noise abatement of any proposed road that hasn't received approval before July 1, 1972. (Modified author abstract) GRA

N75-18123# Transportation Systems Center, Cambridge, Mass.
SUMMARY OF NATIONAL TRANSPORTATION STATISTICS Final Report, Jan. - Dec. 1962
William F. Gay Jun. 1974 129 p
(AD-A001017; DOT-TSC-OST-74-8) Avail: NTIS CSCL 15/5

The report is a compendium of selected national-level transportation statistics. Included are cost, inventory, and performance data describing the passenger and cargo operations of the following modes: air carrier, general aviation, automobile, bus, truck, local transit, rail, water, and oil pipeline. The report includes basic descriptors of U.S. transportation, such as operating revenues and expenses, number of vehicles and employees, vehicle-miles and passenger miles, etc. As its name implies, the report is a summary of a larger data base, consisting of time-series collected from a variety of government and private statistical handbooks. In this edition, the selected data cover the period 1962 through 1972. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N75-18124 Oulu Univ. (Finland). Aarne Karjalainen Observatory.
POLYTROPIC STELLAR MODELS IN THE PROJECTIVE THEORY OF RELATIVITY
Heikki Kallio 11 Mar. 1974 30 p refs
(ISBN-951-41-0186-3; Rept-411) Copyright. Avail: Issuing Activity

Numerical solutions of the projective-relativistic field equations, which give the internal structure of a compressible fluid sphere in quasistatic equilibrium under its own gravitational field are described. The effects due to variations in the constant of gravitation are determined. The results are compared with corresponding general-relativistic calculations. Main features of the projective theory of relativity are discussed. The projective-relativistic equations of mechanical equilibrium fluid sphere are derived and transformed in an adequate dimensionless form. The results obtained by numerical integration of field equations are presented. These include representation of the internal structure for some typical cases, a method for determination of the internal structure of a polytrope with a given mass and radius, and a brief discussion of the stability. Author

N75-18125# Massachusetts Univ., Amherst.
MODEL OF SATURN'S RINGS THAT SATISFIES THE OBSERVED PHASE CURVE FOR OPTICAL SCATTERING
William M. Irvine [1973] 12 p refs Reprinted
Avail: NTIS HC $3.25

Theoretical models of Saturn's Rings are proposed which match the shape of the phase curve and the absolute surface brightness of the rings by varying the particle albedo as a function of wavelength, thus obviating the need to consider diffraction by the particles. The effect of multiple anistropic scattering and of the solar penumbra are included. The shape of the phase curve is dependent on the fraction of multiple scattering, the shape of the individual particle phase function, and the parameters that determine the shadowing effect in first-order scattering (principally the volume density and optical depth). These parameters are determined by the models. J.M.S.

N75-18126*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
CELESCOPE CATALOG OF ULTRAVIOLET STELLAR OBSERVATIONS. MAGNETIC TAPE VERSION
Robert J. Davis, William A. Deutschman, and Katherine L. Haramundanis 3 May 1973 209 p refs
(Contract NAS5-1535)
(NASA-CR-136750; SAO-Special-Report-350) Avail: NTIS HC $7.25 CSCL 03A

Observational results obtained by the celescope experiment during the first 16 months of operation of NASA's Orbiting Astronomical Observatory are presented. Results of the stellar observations are listed along with selected ground-based information obtained from the available literature. Author

N75-18127# Cambridge Univ. (England). Inst. of Astronomy.
[OBSERVATIONS AND THEORY FOR GALAXIES AND STARS] Annual Report, 1973 - 1974
31 Aug. 1974 22 p refs
Avail: NTIS HC $3.25

Progress is reported on observational and theoretical programs on galaxies and stars. Developmental work on various related instrumentation is also included. J.M.S.

N75-18128# Texas Univ., Austin. Center for Particle Theory.
REALISTIC LOWER BOUND FOR THE MAXIMUM MASS OF NEUTRON STARS
R. L. Bowers, D. Pedigo, A. M. Gleeson, and R. L. Zimmerman May 1974 16 p refs Sponsored by AEC
(ORO-3992-185; CPT-229) Avail: NTIS HC $3.25

An improved equation of state for neutron matter which includes relativistic pion exchange is used to calculate neutron star masses and moments of inertia. The equation of state sets a reasonable lower bound on the softness of cold superdense matter, and leads to a maximum equilibrium neutron star mass of 0.52M solar radii. Processes which could effect our conclusions such as hyperionization, non-normal ground states, solidification, and local anisotropy are discussed. Author (NSA)

N75-18129# Naval Weapons Center, China Lake, Calif.
NOMOGRAMS FOR COMPUTING SUN ANGLES Target Acquisition Study, Jan. - Jun. 1973
Carol J. Burge Aug. 1974 27 p refs
(AD-A000099; NWC-TP-5689) Avail: NTIS CSCL 03/1

Effects of sun angle upon the appearance of targets and their surroundings and the effects of shadows and reflections on air-to-ground visual target acquisition are discussed. Nomograms are given for use in computing sun position relative to the horizon. The report describes a method for using two or three nomograms (depending upon the season) and tabulated data to determine the sun's asimuth and elevation for: any day of the year, any longitude, latitudes between 72 deg N and 72 deg S, and hours of the day between 0600 and 1800. The nomograms can be used in mission planning to select aircraft headings that will take advantage of the position of the sun. (Modified author abstract) GRA

N75-18130# Army Foreign Science and Technology Center, Charlottesville, Va.
WORK CARRIED OUT AT PULKOVO OBSERVATORY IN THE FIELD OF GEODETIC ASTRONOMY
V. S. Gubanov, D. D. Polozhentsev, and M. S. Chubei 7 Jan. 1974 7 p refs Transl. into ENGLISH from Geodeziya i Kartografiya (USSR), no. 5, 1972 p 59-62
(AD-A001478; FSTC-HT-23-997-73) Avail: NTIS CSCL 03/1

A Catalog of Geodetic Stars was compiled. Star coordinates and proper motions in the FK4 system, star coordinates recalculated to the 1975.0 epoch and equinox, and Talcott pair ephemerides were compiled on the basis of the catalog. The main bulk of the calculations were done by computer. A library of programs applicable to both observatory and field observations has been developed Content of a typical program and processing times of various types of observations are presented. GRA

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N75-18131 Oulu Univ. (Finland). Aarne Karjalainen Observatory.
GRAVITATIONAL COLLAPSE IN THE PROJECTIVE THEORY OF RELATIVITY
Heikki Kallio 9 Apr. 1974 9 p refs
(ISBN-951-41-0190-1; Rept-414) Copyright. Avail: Issuing Activity

The equations describing in Jordan's projective theory of relativity the geometry outside a collapsing spherically symmetric mass distribution are studied. They are found to have a time-independent solution. The free-fall collapse of a star is examined. It is shown to stop after a finite elapse of time and to turn into an expansion. Author

N75-18132# Chalmers Univ. of Technology, Goteborg (Sweden). Research Lab. of Electronics.
HIGH RESOLUTION SPECTRA OF SOME STRONG GALACTIC OH EMISSION SOURCES
B. O. Roennaeng 1972 46 p refs
(RR-101) Avail: NTIS HC $3.75

The 84-foot (25.6 m) radio telescope of the Onsala Space

Observatory was used for detailed examinations with 250 Hz resolution of the 18 - cm spectral line emission from strong OH sources. Models obtained by incoherent superposition of circularly polarized Gaussian features were fitted to the spectra. The observations were compared with earlier measurements for evidence of variabilities and of possible correlation between changes in intensity and line-width. An intensity change by a factor of seven over a week was observed in one component of the right circularly polarized emission of W75B at 1665 MHz. Author

N75-18133*# Stanford Univ., Calif. Inst. for Plasma Research
COMPARISON OF INFERRED AND OBSERVED INTERPLANETARY MAGNETIC FIELD 1970 - 1972
John M. Wilcox, Leif Svalgaard, and Peter Hedgecock Dec. 1974 20 p refs
(Grant NGR-05-020-559; Contract N00014-67-A-0112-0068; Grant NSF DES-74-19007; et al)
(NASA-CR-142152; SU-IPR-600) Avail: NTIS HC $3.25 CSCL 03B

The inferred polarity (towards or away from the sun) of the interplanetary magnetic field at earth using polar observations of the geomagnetic field has been compared with spacecraft observations. A list published by Svalgaard of the inferred field polarities during 1970 through 1972 is found to be correct on 84 per cent of the days. A near real time (same day) method of inferring the polarity of the interplanetary magnetic field using geomagnetic observations at Vostok and Thule is in use at the NOAA Space Environment Laboratory, Boulder, Colorado. During 1972 this method is found to be correct on 89 per cent of the days. A list of well-defined sector boundaries at earth during 1970 through 1972 is given. Author

N75-18134*# Scientific Translation Service, Santa Barbara, Calif.
STRUCTURE AND CONDITIONS OF THE LUNAR INTERIOR
I. N. Galkin Washington NASA Feb. 1975 5 p refs Transl. into ENGLISH from Priroda (USSR), no. 10, Oct. 1974 p 105
(Contract NASw-2481)
(NASA-TT-F-16163) Avail: NTIS HC $3.25 CSCL 03B

The current opinions regarding the structure of the moon are presented. The data are based on seismograph readings obtained on the lunar surface through the Apollo program and Russian space programs. Descriptions are prepared on the lunar crust, upper mantle, middle mantle, lower mantle, and core of the moon. Author

N75-18135*# Scientific Translation Service, Santa Barbara, Calif.
GLOBULAR STAR CLUSTERS
B. V. Kukarkin Washington NASA Feb. 1975 155 p refs Transl. into ENGLISH of the book "Sharovyye Zvezdnye Skopleniya, Obshchiy Katalog Sharovykh Zvezdnykh Skopleniy Nashey Galaktiki, Soderzhashchiy Privedennyye k Yedinoy Sisteme Kharakteristiki 129 Obyektov" Moscow, Nauka Press, 1974 p 4-136
(Contract NASw-2483)
(NASA-TT-F-16157) Avail: NTIS HC $6.25 CSCL 03B

Different physical characteristics of globular star clusters of our galaxy, obtained from observations performed at different astronomical observatories throughout the world are examined. The first part presents the investigations of different observations and formulas for reducing the observations to a uniform system. The second part gives a catalog of all the globular clusters of all galaxies which are known at the present time, and presents their characteristics in a uniform system with an indication of the sources. The book is designed for specialists in astronomy, students and aspirants studying astronomy. Author

N75-18136*# Yale Univ., New Haven, Conn. Dept. of Astronomy.
[PHYSICAL PROPERTIES OF GIANT PLANETS] Final Technical Report, period ending 30 Sep. 1973
Rupert Wildt 27 Mar. 1974 3 p refs
(Grant NGR-07-004-010)
(NASA-CR-142163) Avail: NTIS HC $3.25 CSCL 03B

The chemical identification and physical nature of giant planets are discussed. The phase equilibria of H2-He mixture is briefly described for these large planets. M.C.F.

N75-18137*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE MAGNETIC FIELD OF MERCURY, PART 1
N. F. Ness, K. W. Behannon, R. P. Lepping, and Y. C. Whang (Catholic Univ. of Am.) Nov. 1974 32 p refs Submitted for publication
(NASA-TM-X-70832; X-690-75-32-Pt-1) Avail: NTIS HC $3.75 CSCL 03B

An updated analysis and interpretation is presented of the magnetic field observations obtained during the Mariner 10 encounter with the planet Mercury. The combination of data relating to position of the detached bow shock wave and magnetopause, and the geometry and magnitude of the magnetic field within the magnetosphere-like region surrounding Mercury, lead to the conclusion that an internal planetary field exists with dipole moment approximately 5.1 x 10 the 22nd power Gauss sq cm. The dipole axis has a polarity sense similar to earth's and is tilted 7 deg from the normal to Mercury's orbital plane. The magnetic field observations reveal a significant distortion of the modest Hermean field (350 Gamma at the equator) by the solar wind flow and the formation of a magnetic tail and neutral sheet which begins close to the planet on the night side. The composite data is not consistent with a complex induction process driven by the solar wind flow. Author

N75-18138*# Atlantic Science Corp., Indialantic, Fla.
EXPLANATION OF THE COMPUTER LISTINGS OF FARADAY FACTORS FOR INTASAT USERS
G. Nesterczuk, S. K. Llewellyn, R. B. Bent, and P. E. Schmid Nov. 1974 47 p refs
(Contract NAS5-21972)
(NASA-CR-143692; ASC-74-F-015) Avail: NTIS HC $3.75 CSCL 03B

Using a simplified form of the Appleton-Hartree formula for the phase refractive index, a relationship was obtained between the Faraday rotation angle along the angular path and the total electron content along the vertical path, intersecting the angular at the height of maximum electron density. Using the second mean value theorem of integration, the function B cosine theta second chi was removed from under the integral sign and replaced by a 'mean' value. The mean value factors were printed on the computer listing for 39 stations receiving signals from the INTASAT satellite during the specified time period. The data is presented by station and date. Graphs are included to demonstrate the variation of the Faraday factor with local time and season, with magnetic latitude, elevation and azimuth angles. Other topics discussed include a description of the bent ionospheric model, the earth's magnetic field model, and the sample computer listing. M.J.S.

N75-18139# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ASTRONAUTICS: ACHIEVEMENTS AND PROSPECTS
V. Glushko 2 Oct. 1974 11 p Transl. into ENGLISH from Pravda (Moscow), no. 102, 12 Apr. 1974 p 3
(AD-A000126; FTD-HC-23-2493-74) Avail: NTIS CSCL 03/2

A brief discussion of what has been accomplished in the study of space and the prospects opening up in this field is presented. GRA

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N75-18140*# Lumonics Research Ltd., Ottawa (Ontario).
USER GUIDE TO 1:250000 SCALE LUNAR MAPS
Danny C. Kinsler Mar. 1975 24 p

(Contract NSR-09-051-001)
(NASA-CR-136753) Avail: NTIS HC $3.25 CSCL 03B

Background information of detailed photo base maps produced from orbital and surface experiments data derived from Apollo missions 15, 16, and 17 is presented in outline form. J.M.S.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N75-18141 British Library Lending Div., Boston Spa (England).
THE 22-YEAR CYCLE OF SOLAR ACTIVITY AND THE ATMOSPHERIC PRESSURE FIELD
V. P. Karklin 1974 15 p refs Transl. into ENGLISH from Izv. Uses. Geog. (Moscow), v. 105, 1973 p 275-280
(BLL-M-23297-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The cyclic fluctuations are analyzed of the atmospheric pressure fields in the middle and high latitudes of the Northern Hemisphere. The time characteristics are examined by means of mathematical filtration of the time series. The method consists of dampening or weakening fluctuations or weight function. Analysis of the spatial distribution of pressure anomalies indicated that the 22-year pressure variation have the nature of standing waves. The node line is described, and antinodes are identified. It is concluded that 22-year fluctuations in solar activity acting on general atmospheric circulation appear to be capable of significantly determining the weather and climate of the middle and high latitudes in the Northern Hemisphere. N.E.R.

N75-18142 British Library Lending Div., Boston Spa (England).
SOLAR ACTIVITY AND SEASONAL WEATHER IN CENTRAL EUROPE
K. Rocznik 1974 12 p refs Transl. into ENGLISH from Meteorol. Rdsch. (USSR), no. 26, 1973 p 129-132
(BLL-M-23591-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The results of research on the relation of warm and cold seasons to sunspot cycles are reported. The climatology was studied for 20 sunspot cycles from 1755 to the present. It is concluded that an increase in sunspot activity results in an increase in summer temperature. F.O.S.

N75-18143 British Library Lending Div., Boston Spa (England).
THE EFFECT OF THE 22-YEAR CYCLE OF SOLAR ACTIVITY ON THE ATMOSPHERE IN THE NORTHERN HEMISPHERE
A. I. Ol and B. A. Slepcov-Sevlevic 1974 13 p refs Transl. into ENGLISH from Arkt. Antarkt. Nauc.-Issled. Inst. Probl. Arkt. Antarkt. (Leningrad), v. 40, 1972 p 84-94
(BLL-M-23545-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The existence of a 22-year cycle in long-term variations in the atmospheric circulation is discussed. Supporting evidence is presented, with references made to previous research. Charts of pressure isoanomalies are compared with charts of isoanomalies in the solar barometric wave, to demonstrate that the 22-year cycle is responsible for 30-50% of the long-term pressure fluctuation. N.E.R.

N75-18144*# Aerospace Corp., Los Angeles, Calif.
[SOLAR X-RAY STUDIES] Final Report
Joan A. Vorpahl 5 Jan. 1975 3 p refs
(Grant NGR-05-084-002)
(NASA-CR-142164) Avail: NTIS HC $3.25 CSCL 03B

The hard X-ray component in the impulsive phase of solar flares is reported. Observations from OGO-5 OSO-7 show no center-to-limb effect of soft X-ray flare. These soft events were plotted separately as a function of solar longitude. M.C.F.

N75-18145# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
COMPILATION OF SOLAR PARTICLE AND INTERPLANETARY MEASUREMENTS ACQUIRED DURING THE CAMPAIGN FOR INTEGRATED OBSERVATIONS OF SOLAR FLARES (CINOF)
M. A. Shea and D. F. Smart 19 Jun. 1974 150 p refs
(AF Proj. 8600)
(AD-A000017; AFCRL-TR-74-0271; AFCRL-SR-177) Avail: NTIS CSCL 03/2

The Campaign for Integrated Observations of Solar Flares (CINOF) was a period of extensive solar flare studies conducted 5-29 June 1972. During this period two discrete solar particle injections occurred, in addition to which significant modulations to the low energy solar particle background flux were present. This report contains fifteen individually authored papers presenting the X-ray, solar particle, and other related interplanetary and geophysical measurements obtained from 28 May - 30 June 1972. A final paper summarizes the particle measurements for the eleven particle enhancements identified during this period. Author (GRA)

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N75-18146*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC RAY DIFFUSION: REPORT OF THE WORKSHOP IN COSMIC RAY DIFFUSION THEORY
Thomas J. Birmingham and Frank C. Jones Washington Feb. 1975 22 p refs Conf. held at Greenbelt, Md., 16-17 May 1974
(NASA-TN-D-7873; G-7542) Avail: NTIS HC $3.25 CSCL 03B

A workshop in cosmic ray diffusion theory was held at Goddard Space Flight Center on May 16-17, 1974. Topics discussed and summarized are: (1) cosmic ray measurements as related to diffusion theory; (2) quasi-linear theory, nonlinear theory, and computer simulation of cosmic ray pitch-angle diffusion; and (3) magnetic field fluctuation measurements as related to diffusion theory. Author

N75-18147# Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia).
FLUX DENSITIES OF DISCRETE RADIO SOURCES AT 3.5 cm, 2
A. G. Gorshkov, E. E. Spangenberg, I. E. Valtz, L. M. Gindilis, and Konnikova 1970 3 p refs Transl. into ENGLISH from Astron. Tsirk., no. 545, 1970 p 1-3
(CSIRO-Trans-11333) Avail: AEC Depository Libraries HC $4.00

The investigation of discrete radio sources emitting at 3.5 cm wavelength is reported. Tables are given which list source names and peak values of flux density. Author (NSA)

N75-18148# Pennsylvania Univ., Philadelphia. Dept. of Physics.
ANTINEUTRINO PULSES EXPECTED FROM VIBRATIONS OF A NEWLY FORMED HOT NEUTRON STAR
S. A. Bludman, J. M. Cohen, and K. Lande Jun. 1974 13 p refs
(COO-3071-98; UPR-0031T) Avail: NTIS HC $3.25

The data presented recently by Lande, et. al. has to do with the time structure of the antineutrinos apparently received from an extraterrestrial source. At least four microsecond bursts separated by 0.640, 0.968, and 0.928 ms. were observed. If these bursts originated in an isotropically emitting source near the galactic center, then about 3 x 10 to the 52d power ergs is contained in each ms burst. It is shown that the approximately millisecond period is characteristic of matter at high density and the microsecond burst width is characteristic of an extremely temperature- and density-dependent emission mechanism and a mean free path (approximately 500,000 cm) characteristic of high-energy antineutrinos in dense matter. The energy per pulse and number of pulses is what would be expected in the

gravitational collapse of a white dwarf core to a radially pulsating hot neutron star. Author (NSA)

N75-18149# Lund Univ. (Sweden). Dept. of Cosmic High Energy Physics.
THE EFFECT OF SIMULTANEOUS ACCELERATION AND FRAGMENTATION ON THE COMPOSITION OF THE IRON GROUP OF LOW ENERGY COSMIC RAYS
S. Lindstram May 1974 49 p refs Sponsored by Swed. Nat. Sci. Res. Council
(LUIP-CR-74-04) Avail: NTIS HC $3.75

The effect of simultaneous acceleration and fragmentation on the charge composition of the iron group Z between 21 and 26 was investigated. A pure Fe-56 source was assumed and several acceleration mechanisms and potential path length distributions were applied. The iron particles were injected at 40 MeV/nucleon and accelerated to 300 and 1000 MeV/nucleon. It is found that the ratio of the density of nuclei with atomic numbers equal to, or composed between 21 and 25 to the density of iron nuclei depends only weakly on the energy at which matter is traversed. It is, however, a good measure of the amount of matter traversed. The ratio of the density of Ti nuclei to density of Cr nuclei depends on the acceleration mechanism to a degree which makes it possible to distinguish between different acceleration mechanisms from measurements. Author (ESRO)

N75-18150# Lund Univ. (Sweden). Dept. of Physics.
THE ABUNDANCE OF NUCLEI FROM SODIUM TO SILICON IN COSMIC RAYS
R. Andersson Sep. 1974 28 p refs Sponsored in part by Swed. Nat. Sci. Res. Council
(LUIP-CR-74-08) Avail: NTIS HC $3.75

The expected charge spectrum at the top of the atmosphere was calculated for the charge interval Z between 11 abd 14. The calculations were based on the assumption that cosmic ray particles are selected by an ionization process from matter having 'normal' composition. The ratios Na/Mg, Al/Si, and (Na+Al)/(Mg+Si) were studied as a function of the amount of matter passed for different transport models and compared with experimental results. If the transport takes place at the constant energy E=800 MeV/n, the comparisons indicate a path length of about 4 g/sq cm for a slab model and a mean path length larger than or equal to 5 g/sq cm for an exponential model. The possibilities of using Aluminum 26 to determine the age of cosmic rays are discussed. Author (ESRO)

N75-18151# Lund Univ. (Sweden). Dept. of Physics.
THE ENERGY DISTRIBUTION OF VERY HEAVY COSMIC RAY NUCLEI WITHIN THE PENUMBRA AT PALESTINE, TEXAS
O. Mathiesen, L. Larsson, and R. Andersson Sep. 1974 24 p refs Sponsored in part by Swed. Nat. Sci. Res. Council
(LUIP-CR-74-09) Avail: NTIS HC $3.25

The low energy end of the rigidity spectrum of cosmic ray nuclei with atomic numbers Z greater than or equal to 18, recorded in a balloon flight conducted from Palestine, Texas, was compared with a corresponding theoretical spectrum based on the computations by Shea and Smart. The two distributions are found to be in qualitative agreement with each other. The spread in apparent particle charge, caused by the theoretical distribution of particle velocity at Palestine, was calculated for detectors with different response functions. The resulting structure of the predicted charge spectrum of iron group nuclei is found to be in good agreement with corresponding experimental data. Author (ESRO)

N75-18152# Explosives Research and Development Establishment, Waltham Abbey (England).
COMPUTER ASSISTED PRESENTATION OF RESULTS FROM ULTRAVIOLET MONITORING TRIALS
B. V. Howes Jul. 1973 18 p refs
(ERDE-TN-92; BR42452) Avail: NTIS HC $3.25

A computer program to perform the presentation of experimental data from incident ultraviolet radiation monitoring at several sites throughout the year is discussed. A computer program, written in ELLIOT 903 ALGOL following these general lines is described, and examples of the output are shown in tabulated and graphical form. ESRO

N75-18153# Naval Academy, Annapolis, Md.
COSMIC RAY ASTRONOMY
David R. Lipinsky 21 May 1974 125 p refs
(AD-A000090; USNA-TSPR-58) Avail: NTIS CSCL 04/1

Time variations in the secondary cosmic ray flux may be attributed to two broad categories of effects: actual variations in the primary cosmic ray flux and variations induced by changing conditions in the atmosphere. Mathematical simulations were developed to investigate the effects of changes in surface temperature and pressure upon a differential spectrum of muons with energies distributed about a muon energy of 400 MeV. The simulations involved considerable modelling of the atmosphere as well as modelling of the production and propagation of the secondary muons. From the response of the simulation to changes in surface temperature and surface pressure, co-efficients of temperature and pressure effects were determined. (Modified author abstract) GRA

N75-18154# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
GEOPHYSICS AND SPACE DATA BULLETIN. VOLUME 11, NUMBER 2: SECOND QUARTER 1974
Anne L. Carrigan Sep. 1974 282 p
(AD-A001025; AFCRL-SR-183; AFCRL-TR-74-0448) Avail: NTIS CSCL 03/2

This Bulletin is a quarterly publication that contains AFCRL contract and inhouse data reported from sites throughout the world. The following types of data are contained within each issue: magnetometer, cosmic ray, ELF noise, riometer, solar optical and radio emission, and ionosonde. This issue covers such data for April, May, and June 1974. GRA

99 GENERAL

N75-18155# Advisory Group for Aerospace Research and Development, Paris (France).
DICTIONARY OF FRENCH TERMS USED IN DOCUMENTATION [DICTIONNAIRE DE TERMES FRANCAIS UTILISES EN DOCUMENTATION]
J. D. Klopp 1974 94 p In FRENCH
(AGARD-AG-180; AGARDograph-180) Avail: NTIS HC $4.75

A dictionary, covering scientific terms used to document information, is presented. Approximately 1,440 items are listed. Transl. by E.H.W.

N75-18156# Czechoslovak National Committee of COSPAR, Prague.
SPACE RESEARCH ACTIVITIES IN CZECHOSLOVAKIA IN 1973
[1973] 16 p refs
Avail: NTIS HC $3.25

Progress in the following research areas is described: (1) solar experiments; (2) VLF satellite experiments; (3) satellite electron temperature measurements; (4) charge particles and radiation belts; (5) scientific uses of satellite tracking; (6) solar wind interaction with the earth; (7) ground based ionospheric research; and (8) interplanetary matter. J.M.S.

N75-18157# Advisory Group for Aerospace Research and Development, Paris (France).
AGARD BULLETIN: MEETING, PULICATIONS, MEMBERSHIP
Jan. 1975 73 p
(AGARD-Bull-75-1) Avail: NTIS HC $4.25

The Advisory Group for Aerospace Research and Development (AGARD) bulletin containing information on all planned 1975 meetings is presented. The information includes dates, locations, and descriptions of the themes. A list of all AGARD publications which were released in 1974 and abstracts of the reports is provided. The membership of the various AGARD committees is reported in a document which identified the name of each representative and the country represented. Author

N75-18158# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 448
3 Jan. 1975 16 p refs Transl. into ENGLISH from East European articles
(JPRS-63799) Avail: NTIS HC $3.25

The history of the Albanian Academy of Sciences is presented, along with the network of research institutes. Several problems encountered in oil field corrosion are listed, as well as technical considerations and inhibitors for lowering corrosion. For individual titles, see N75-18159 through N75-18160.

N75-18159 Joint Publications Research Service, Arlington, Va.
ACHIEVEMENTS OF ACADEMY OF SCIENCES REVIEWED
Bedri Dedja *In its* Transl. on Eastern Europe: Sci. Affairs, No. 448 (JPRS-63799) 3 Jan. 1975 p 1-6 Transl. into ENGLISH from Zeri Popullit (Trana), 23 Nov. 1974 p 3-4 (For availability see N75-18158 09-99)

The conception and history of the Academy of Sciences of Albania are presented. The network of research institutes is briefly discussed, along with their scientific achievements. J.A.M.

N75-18160 Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS CONCERNING CORROSION CONTROL IN ROMANIAN OIL FIELDS **c43**
Al. Constantinescu, P. Constantinescu, and Ioana Borangic *In its* Transl. on Eastern Europe: Sci. Affairs, No. 448 (JPRS-63799) 3 Jan. 1975 p 7-12 refs Transl. into ENGLISH from Mine, Petrol Si Gaze (Bucharest), no. 7, Jul. 1974 p 341-343 (For availability see N75-18158 09-99)

Several problems encountered in oil field corrosion are enumerated, including soluble salts, corrosive gases, acidity, temperature, flow velocity, and steel quality in conduits. Technical considerations for lowering corrosion such as lowered temperatures, slower circulation rates, and aeration avoidance are discussed. The use of inhibitors and bactericides, nonmetallic materials, protective coatings, and cathodic protection are also considered. J.A.M.

N75-18161# United Kingdom Atomic Energy Authority, Harwell (England).
ACTIVITY LIMITS FOR TYPE "A" AND TYPE "B" PACKAGES EXEMPTION LIMITS AND PACKAGE CATEGORIES
A. J. Davies Jul. 1974 12 p
(AERE-M-2636)

The A.E.A. Regulations for the Safe Transport of Radioactive Materials Safety Series No. 6 1973 Revised Edition give exemption limits in Section which are generally based on the activity limits for type A packages given in Table 7 of Section 4. This table is a long list of different radionuclides and the purpose of this paper is to enable the user to determine exemption limits without having to calculate them from the Regulations. Author (NSA)

N75-18162# Commissariat a l'Energie Atomique, Grenoble (France).
DEPARTMENT OF FUNDAMENTAL RESEARCH, GRENOBLE, SEMIANNUAL BULLETIN NO. 4
1973 179 p refs In FRENCH and ENGLISH
(CEA-N-1688) Avail: AEC Depository Libraries HC $12.00

Research carried out during the second half of 1973 is presented. In the field of nuclear physics, this research concerned fission and fission products. The following aspects of solid state physics were investigated: defects and other effects produced by irradiation; magnetic properties of transition elements, rare earth compounds and alloys, and actinides (together with studies of the relevant hyperfine parameters); structure of transition element compounds, alloys, and complexes, and of semiconductors and insulators. Research in the fields of chemistry, physics, and biophysics concerned principally: free stable radicals; biological radical spin labeling; stereochemistry and conformation (NMR) studies; hyperfine deviations due to C-13. Biological research was conducted on the structure and function of proteins, the structure and function of biological membranes, the effects of ionizing radiations on nucleic acids, the mineral nutrition of plants, the cellular differentiation of hematopoietic strain cells, and the structure and function of amino acids. NSA

N75-18163# Interuniversitair Reactor Instituut, Delft (Netherlands).
[RESEARCH ACTIVITIES OF THE INTERUNIVERSITAIR REACTOR INSTITUUT] Annual Report, 1973-1974 [JAARVERSLAG 1973-1974]
31 Aug. 1974 138 p refs In DUTCH
Avail: NTIS HC $5.75

Activities discussed cover the fields of general physics, reactor physics, chemistry, radiation hygiene and dosimetry. ESRO

N75-18164# Naval Electronics Lab. Center, San Diego, Calif.
INDEPENDENT RESEARCH AND INDEPENDENT EXPLORATORY DEVELOPMENT Annual Report
1 Sep. 1974 82 p refs
(AD-A000082; NELC-TD-348) Avail: NTIS CSCL 05/2

This document is an overview of the NELC IR and IED programs. It summarizes the accomplishments achieved within each project in FY74. Longer articles are presented on three of the most significant projects -- ehf Integrated Circuits, Programmable Electro-Optical Processor, and Telecommunication Equipment Low-Cost Acquisition Method (TELCAM). Author (GRA)

N75-18165# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 28, NO. 10
Robert Dolan and Victoria S. Hewitson 31 Oct. 1974 46 p
(AD-A000097; ESN-28-10) Avail: NTIS CSCL 05/2

The monthly publication presents brief articles concerning recent developments in European scientific research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to American scientists by disclosing interesting information well in advance of the usual scientific publications. GRA

N75-18166# Naval Research Lab., Washington, D.C.
REPORT OF NRL PROGRESS
Jun. 1974 75 p
(PB-237383/5) Avail: NTIS HC $4.25: Also available from NTIS on subscription $22.50/year domestic, $28.25/year foreign CSCL 05B

Articles are presented concerning the research in physical metallurgy and materials science; thermonuclear response of materials to pulsed radiation heating; electrochemical aspects of stress-corrosion cracking; and studies of high-strength steels. Progress notes in acoustics, chemistry, mathematics, nuclear sciences and oceanography are included. GRA

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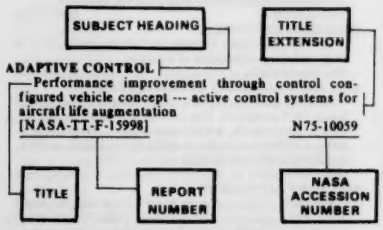

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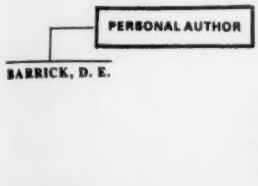

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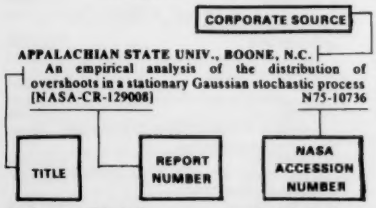

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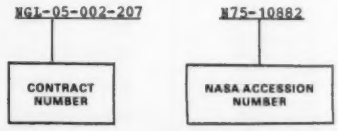

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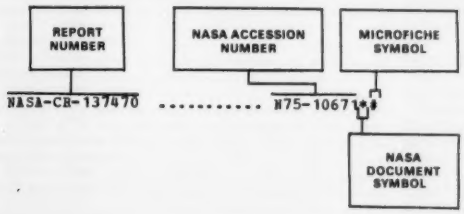

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BLL-RR-TRANS-9249-(8660.5) N75-17468

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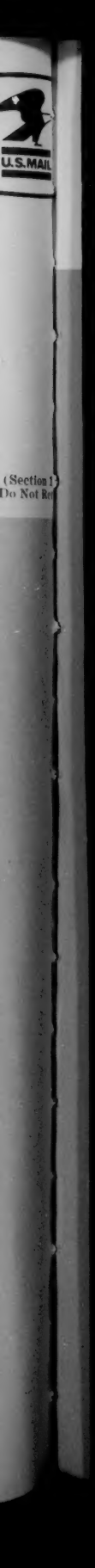
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